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EDITORIAL NOTES.

In Parliament—A Marginless Calorific Standard.

No new gas companies are approaching Parliament through Bill promotions this session, and no non-statutory companies are seeking to be elevated to full statutory rank. There are only nine statutory companies who are asking for supplementary powers and amendment of their existing authorization; and their parliamentary schemes are reviewed in other columns this week. Generally speaking, there is not very much to say about these measures. All the Bills, save that of the Brighton and Hove Gas Company, are proposing the substitution of the illuminating power standard by the calorific value one. Half the eight adopt *in toto* the "Model" calorific clause; the other half have struck out a new course for themselves. But, when it is summed up, it merely amounts to a change without a difference.

The model standard provides for 540 B.Th.U.; the gas being tested so that the total heat value is ascertained. Between this standard and the penalty line is a margin of 7½ per cent.—making the rock-bottom calorific value 499½ B.Th.U. before the suppliers become subject to specified forfeitures. In the cases of the Ilfracombe, Northwich, Spennymoor and Tudhoe, and Warwick Bills, an innovation is now proposed—that a definitive standard of 500 B.Th.U. (with total heat value test) shall be taken without any saving margin before penalties begin to accrue. There is no particular virtue in the 7½ per cent. margin, if a 500 B.Th.U. standard is low enough to safeguard the interests of the gas suppliers. But it would be a great pity for the Private Bill authorities to get the idea that this figure, or any other, is positively the right one under all circumstances. Last year in two Welsh cases, a margin of 12 per cent. was allowed, which brought down the penalty line to about 475 B.Th.U. It will also be remembered that last session there was some discussion with the Lord Chairman as to adopting a standard of 500 B.Th.U. less 5 per cent. Reference to the interview was made in a letter from Mr. R. G. Shadbolt, read by the then President (Mr. Edward Allen) at the meeting of the Institution last June. The communication apprised the members that the Lord Chairman seemed [this was subsequent to the decision on the Gas Light Company's Bill] inclined to give a standard of 500 B.Th.U.; but that he was not quite so ready to make a 5 per cent. allowance from such a standard. He did agree, however, that there might be circumstances warranting the 5 per cent. or even more. With this, most gas men coincide. But the interview manifestly had no lasting effect, seeing that the new "Model" Clauses" follow the Gas Light Company's conditions, by providing for a 540 B.Th.U. standard, with the 7½ per cent. neutral ground. It is a question whether, on the whole, the excision of the 7½ per cent. margin would not be a good thing, with a sufficiently low standard, seeing that it only provides another factor in the conditions with which opponents out for plucking promoters will be tempted to play. When the contest started last year, it was quickly made apparent that the Private Bill authorities considered the precedent South Suburban standard too flexible, with its 12 per cent. margin, and an average drawn from three days' testings; and these conditions were brought down to the 7½ per cent., with an average of two tests in one day applying, if the result of the first test fell below the specified point. If the authorities want to make the standard still more definite, they will without demur accept the 500 B.Th.U. and no margin, though it must not be forgotten that, most companies would not look upon the standard of 540 B.Th.U. as a meaningless expression unworthy of respect, and only have regard to the minimum which marks the line between penalty and safety.

The next interesting point about the group of Bills under notice to-day bears upon recent discussion in our columns regarding the raising of capital by gas companies during war time, and while the influences of the war continue to affect the financial situation. It will be remembered that among the suggestions put forward were relief for a period from both the sliding-scale and auction clauses, and greater liberty in the matter of borrowing powers. Messrs. R. W. Cooper and Sons pointed out in our "Correspondence" columns that one Company in the current session would apply for relief for a term of years from the auction clauses. The Company is, we now find, the Ascot; and in the Bill a provision appended to the auction clauses will, if allowed, suspend their operation for five years, or longer if the Board of Trade deem prolongation desirable—the Directors asking for the right during that time to create and issue capital at such price and on such terms and conditions as they may think fit. It will be extremely interesting to watch the fate of this proposal, made under exceptional, and, in fact, unprecedented, circumstances. As the discussion in our columns has shown, a very good case can be made out for relaxation, now and during the next few years, of the financial conditions under which gas companies work.

The singular case of the Warwick Gas Company is to be brought before Parliament this session. It has not been to Parliament since George the Fourth was King; and it has been under no control as to dividend, price, and quality. It has spent liberally upon the undertaking out of undivided profits, and has paid a pleasing dividend to the holders of its small capital. The scheme embodied in the Bill is not one for discussion prior to the decision of Parliament upon the capitalization case put forward. But to say the least we have here presented one of the most interesting pieces of statutory company history that has ever been sketched in the preamble of a Gas Bill.

Coke-Oven Gas for Middlesbrough.

THE article published in our columns last week about the supply of coke-oven gas to Middlesbrough cannot be allowed to pass without special notice, seeing that it marks for this country an important change in the provision of town gas and in gas policy. Small gas-works and villages had been supplied with coke-oven gas long before the Middlesbrough Corporation—for a period shy, but now actually receiving a large quantity daily—put their seal to an agreement for a supply of gas from the new coke-ovens of Sir B. Samuelson and Co., Limited; but all that has preceded has been relatively of insignificant order. Germany and America have developed the use of coke-oven gas to an extent that may possibly never be reached in this country—at any rate, we do not anticipate that it will be. For this country, however, this purchase of practically crude coke-oven gas by Middlesbrough for town supply is a substantial starting-point in what may prove to be an exceedingly large development in the neighbourhoods of the coalfields, although in more distant localities the chances are that coke-ovens will in time form (as at Birmingham, Darwen, and on smaller scale at Ferndale) part of the carbonizing equipments of large gas-works. In the last session of Parliament the Middlesbrough Corporation were putting themselves in legal position for giving effect to their agreement with Sir B. Samuelson and Co. In their Act, the Corporation obtained power "to enter into, and carry into effect, agreements with "any company or person for the supply of gas in a crude, "or partially purified, state by such company or person to "the Corporation for such remuneration, on such terms "and conditions, and for such period, as the Corporation "may think fit." Other local authorities have included the same clause in the Bills being promoted this session. At the same time, the Corporation obtained the calorific value standard on the Gas Light Company's terms.

The three greatest difficulties that have hitherto presented themselves in connection with the utilization of coke-oven gas have been (1) the unreliability of the supply owing to labour troubles in various directions, and to the inconstancy in the market requirements for metallurgical coke; (2) the wide variation in the quality at different stages of

production of coke-oven gas; and (3), where direct recovery is practised, the destruction of part of the illuminating constituents of the gas. In regard to these matters, the only one to fear to-day is inconstancy through labour disturbances. These will ever be the chief uncertainty; and with the responsibilities upon gas undertakings in relation to the maintenance of supply, there must always be coal-gas or water-gas plant in reserve to compensate for any stoppage of the part of the supply derived from external coke-oven plant. In this particular case, the importance of the question of protection against any cessation of supply is seen by the fact that the "Otto" regenerative ovens from which the Middlesbrough supply is obtained are designed to furnish 1,600,000 cubic feet of gas suitable for town use. With regard to the qualitative points, Durham coal is used, and only the first 42 per cent., or thereabouts, of the gas produced is taken for town consumption. It does not matter much now what happens to the illuminating power, so long as the gas is not destitute of luminosity for purposes where small luminous flames are still desirable. The illuminating power cannot avoid some depreciation, in view of the treatment to which the gas is subjected in the direct-recovery process. The process here is: The gases are first cooled to dew-point; there are air-coolers which can be bye-passed, or used, as occasion arises in order to regulate the temperatures; the gas then travels through tar-sprays, where hot liquor and tar at high pressure are forced into violent contact with the gases, which operation frees them from tar; then the clean gases are drawn through saturators where the ammonia contents are converted into sulphate of ammonia, which, after drying, is of 25 per cent. quality. Then to remove the water vapour, the gases are drawn through surface coolers, and afterwards through spray coolers to reduce the temperature to normal. The sudden cooling throws down naphthalene; and any that remains is removed by means of benzolized creosote oil. The use of the benzolized creosote oil assists in preventing the further depreciation which occurs when washing cold gases with plain creosote oil.

Chief in importance is a point concentrated in one sentence of the special article published last week: "The gas "supplied consistently averages by the calorimeter about "600 B.Th.U. net." This is much above the parliamentary standard of 540 B.Th.U. (total heat value), with 7½ per cent. allowance. But taking the 540 B.Th.U., there is a very good margin in the 600 B.Th.U. net for the production of retort gas or carburetted water gas of, within limits, lower calorific value, and still comply with parliamentary requirement.

This is for this country the first large-scale business engagement between an urban gas undertaking and external coke-ovens; and therefore the history of the arrangement will be narrowly watched. Upon its success will depend much development elsewhere in the future. The supply has now been given to Middlesbrough for close upon three months. Constancy of calorific quality and of supply under normal circumstances has been proved. In line with constancy is the question of price. It must be such as to allow of the provision in the gas-works of the necessary reserve of plant to tide over any labour trouble or other misadventure at the source of the coke-oven supply.

Sulphate of Ammonia and the Cultivation of the Corn Factor.

If there is one thing the men having the management of the affairs of the gas industry have learnt well by reason of the necessities of their position, it is the supreme importance of becoming acquainted with the needs of those who use their products, and provide accordingly. The erstwhile policy of the gas industry was to act as producers, and sell without exercising much concern as to whether or not the product was the best suited for the requirements of the customer, or troubling itself over the question as to whether there might be development of business by cultivating a more intimate knowledge of those requirements, and by helping to ascertain whether it was possible to secure for the users a greater efficiency in the application of the product. A change has set in. It is spreading; and we hope to see it have considerable influence throughout all departments of the industry's trading. Take, for example, the industrial gas-heating business. This would never have made the rapid strides that it has done if the gas man had stayed at home, and had not succeeded in penetrating beyond his neighbours' factory gates. The same with coke. Had there not been a closer study of the requirements of the user, some gas-works would have been in a considerably worse plight than they are in to-day, when new business is being done with coke for steam-raising and for water heating in bulk, and more effective way is being made—slowly but surely—to the domestic hearth. Again with tar the needs of the road maker have been ascertained, and the value of a proper tar-dehydration system has been found to the advantage of the gas-works product.

But the interests of sulphate of ammonia have been left very much out in the cold, in so far as the business relations of producers and home users are concerned. The Sulphate of Ammonia Committee have been active and beneficial workers; but there are many producers who have left the matter there, and have rendered them no assistance. Little heed has been paid by them to the question as to whether their product was of the best commercial quality, and whether their business relations with the local agriculturist were of the best and the most influential. Many producers, too, know comparatively little as to the best forms of applying sulphate of ammonia to the particular soils in their neighbourhoods for the particular crops grown upon these soils. Individually the gas manager cannot be expected to know everything; but it is his responsibility to obtain, by the most potent means, the best value for each and every one of the commodities he makes. Only recently the Sulphate of Ammonia Association pointed to the necessity of greater attention being paid to the production of sulphate of 25 per cent. ammonia content, and to the restriction of the moisture and acid to specified percentages. There was imperative commercial need for this qualitative question being forced home. Again, if there was one lesson that rose above all others from Mr. John West's paper before the Institution of Gas Engineers last June, it was that of the advantage, in local sulphate of ammonia developments, of getting into closer touch with the needs of the farmer. The farmer to-day, paying heavier wages and with the cost of living on a higher scale, finds that his enterprise has not in it the same profit as in olden times. He must therefore apply to science for assistance. In the present national crisis, too, the farmer sees an opportunity of turning it to good account and improving his position by devoting himself to more intensive farming. He can only accomplish his purpose by calling science to his aid.

These considerations lead us to something else, and that "something else" is peculiarly opportune as a matter for discussion at the opening of this year, and under its circumstances. When commenting on Mr. West's paper read before the Institution, we made this remark: "Mr. West is "anxious the home trade for sulphate of ammonia should "be more strenuously cultivated, and the land of this "country made much more profitable. One way of bring-"ing this about may be by entering into better trade rela-"tions with the farmers. They are people, for instance, "who can do with a little credit; their revenue only coming "in with the reaping of the harvest." But the business methods of the producer of sulphate of ammonia and of the man who wants an artificial fertilizer to apply to his land appear to be very much at variance. The business methods and conditions of the gas industry are not particularly appropriate for the giving of the credit accommodation to which we referred last June, and which is required by many a farmer. But the position has to be met, or otherwise the farmer will take the line of least resistance, and patronize those exotic fertilizers in the purchase of which he can obtain credit. What is therefore wanted is someone who can act as a "go between." Where is the suitable man to be found? He must be a man with the requisite qualifications already existent. He must be a man on terms of business, and in constant intercourse, with farmers; these being the qualifications which give him the necessary opportunities for promoting sales. Looking around, there is only one man upon whom hand can be placed who fulfils all the requirements, and that man is the corn factor. But the corn factor has been a person who has hitherto been much ill-used by the sulphate of ammonia producer. The producer has required all the wheat, and has left the corn factor little else but the husks. The producer has wanted all the cash sales, and has competed with the corn factor for them; and the consequence has been that the latter has been practically left with only the business offered by farmers who required long credit or other accommodation. Forsooth, under these conditions there has not been much

encouragement for the corn factor. What has been the result? It has not been to his interest to push sales of sulphate of ammonia. He has consequently, turned from the home-produced fertilizer to the foreign nitrogenous fertilizers, which, as far as he is concerned, possess a protected market, in which he has no competitors. Yet the corn factors are numerically strong, and they are strong in influence in the farming community. Under these circumstances, the existing state of affairs is highly prejudicial to the interests of sellers of sulphate of ammonia. In short, the corn factor is a factor (in quite another sense) of an important order. He should be cultivated, and not be exposed to competition. His business interest must be to foster, and not to operate against, the use of the British-made fertilizer. It is therefore hoped that his advantageous position will be brought into play to secure an enlargement of the home sulphate of ammonia business. In this there will be common advantage to producer, factor, and farmer. It is a matter of business, and one worthy of close and immediate attention.

Electrical Consumption in Gas-Works Operations.

A FEW weeks ago, when writing on the subject of the use of electricity in gas-works, reference was made to the want of reliable data as to the electricity expenditure for individual operations on a gas-works. Allusion was also made to the fact that Mr. Charles Hunt, on a visit to the new South Gas-Works of the Amsterdam Municipality, had been struck by the fact that the Chief Engineer (Mr. J. van Rossum du Chattel) had installed indicators for obtaining information regarding, and maintaining control over, the use of electricity for all the different operations on the works. Mr. Rossum du Chattel, as we have known of old, is nothing if not complete in every detail of his professional work; and, being desirous of learning more about his new works and his electrical experiences thereon, we invited him to contribute an article to our columns in order to give his British colleagues the advantage of these experiences. Ever-courteous, he complied; and the result is one of the features of this week's issue of the "JOURNAL." The article supplies information supplementing that published on Nov. 24 as to the new works. It also gives a detailed description of the electricity plant; and then follow particulars as to the consumption of electricity for the various purposes for which it is used at Amsterdam.

The period that is covered by the working data is the twelve months ending on Oct. 1 last; and, during that time, 1219 million cubic feet of gas were made at the new station. Throughout the works' operations, there is a wonderful application of electricity—not only to driving the coal and coke handling plant, but to lighting, driving the motors for high-pressure gas, for water raising, and for operating the machine-tools in the shops on the works. The total use of electricity for all these purposes—the electricity being supplied from the works' private generating plant and from the municipal cables—was during the year 565,624 K.V.A.-hours; some 69 motors being employed. While the first table which Mr. Rossum du Chattel gives us is highly instructive as to the consumption of energy by the different parts of the plant—showing by comparison which is the most voracious and which is otherwise in the system of operation—it does not supply us with what we should have liked to see, the expenditure of energy set out per unit of work done.

In other words, we should have been glad to learn the approximate consumption for each operation, in connection with the coal and coke handling plant, at per ton of material handled. Perhaps some time, when our busy friend has a little further leisure, he will add to our present indebtedness by supplying this information. However, we are grateful for the pains that he has taken in writing the present article and in compiling the accompanying data. If we detach from the total the consumption of energy for miscellaneous purposes, we find that it amounts to 110,858 K.V.A.-hours; and, deducting this from the total consumption, we have remaining 454,766 K.V.A.-hours for the complete coal handling and coke plant. Calculating this out over the production of 1219 million cubic feet, it is found to average 2·68 K.V.A.-hours per 1000 cubic feet, which, for such comprehensive power purposes—from coal-cranes throughout the coal and coke handling plant to boiler-house—appeals to us as being very economical for power.

Upon the excellent results that are being achieved at the South Gas-Works at Amsterdam, there must be congratulation to Mr. Rossum du Chattel. In production of gas, quality, and working costs they are justifying themselves and their originator. Remembering that good gas-making coal has to be conveyed a distance to Amsterdam, a cost of 16·16 fl. per 1000 cubic metres in the holder, or (roughly) 9d. per 1000 cubic feet, is successful working. The 16·16 fl. is 6·18 fl. less than the average (22·34 fl.) for the three works of the Amsterdam Municipality. The average, however, includes the economical working at the South station, so that this station really stands in better position in relation to the other two stations than the figures as now presented indicate.

The War and Gas and Electricity Consumption.

A contributor to "The Times" has been collecting information relative to the effect of the reduced street and shop lighting upon the sales of gas and electricity; the net result being that the fall in consumption is not expected to be of a startling order. He reports that the Gas Light and Coke Company have experienced a lessened output; but it is not regarded as serious. "We are bearing our little share of the war with equanimity," said a leading official. At the offices of the South Metropolitan Gas Company, the contributor learned that they would suffer more loss than other areas by the darkening regulations, inasmuch as the high-pressure system outside shops had possibly been more fully developed in their district than elsewhere. At the same time, it is not expected there will be a heavy fall in the sale of gas. For our own part, we shall possess our souls in patience for the half-year's accounts for definite information, as it is anticipated that, when these are available, it will be found that the percentage decline will not be of an astounding order. When one considers the effect that the darkening of the streets and shops has had in inducing people to spend more time at home, together with the diverse uses of gas, particularly in households for cooking and heating, as well as the dark, foggy, and cold days experienced lately, it is pretty clear that there are material considerations to set-off against the drop in consumption directly produced by the more or less needful official regulations. Electricity supply undertakings have suffered most where shop and street lighting form the staple part of their load; in residential areas the lighting load has not suffered greatly; and in industrial districts the power load has not been substantially affected—on the contrary, where the war has stimulated work, there has been an increase of the output for power purposes.

Accidents and Reduced Street Lighting.

The foolish air raids in the south-eastern part of the country are not going to produce any further stiffening of the public lighting regulations in the Metropolis. As a matter of fact, they would not bear much further stiffening unless the authorities desired to make the streets unusable when daylight fails. It is fortunately considered that the existing orders are quite adequate. Further prosecutions show that the police authorities are very properly not inclined to stand any nonsense from recalcitrant shop keepers and cinema proprietors; but it is gratifying to find that, on the whole, there is quite a satisfactory compliance with the lighting orders. One point about which no reliable information is forthcoming is as to whether street accidents are now more prolific after dusk owing to the nebulous conditions that prevail. On the one hand, it is stated that it is erroneous to suppose that the reduction of public lighting has led to more accidents—that although the last returns show an increase, this is entirely due to daylight misadventure. On the other hand, the Southwark Coroner was asserting only a few days since that he had lately held nine inquests in which the darkening of the streets had been the cause leading to death. He had also had four cases of persons being killed at London Bridge. "The darkening of the streets," he said, "was becoming a very serious matter." Between these statements it is impossible to draw any safe conclusion. Reduced public lighting has resulted in diminished vehicular and pedestrian traffic in the streets after dusk; and therefore the accidents should be proportionately fewer. If they are generally more (Southwark may be an exception), then it shows that pedestrians and drivers are not obeying the obligation which rests upon them of exercising greater care under abnormal conditions.

Ammonia from Cyanamide.

When the Nitrogen Products and Carbide Company, Limited, was first introduced as one of the concerns destined to add to the economy of the world, it was predicted that all the fertilizer using world would in time be at its feet. Proof of this has yet to develop itself; but meantime it is of interest to notice that there is some modification in that quarter of former grandiloquent language, and signs, if meagre, of some respect for the existing fertilizer competitors. Now it is anticipated that the Company will become a "most important factor in the nitric acid, ammonia, and fertilizer markets of the world." Maybe it will. There is not the slightest doubt that the concern is shaping itself for doing an extensive business; but it is equally clear, from what transpired at the first annual meeting the other day, that the nitric acid business is to be the primary one, and the fertilizer business will take secondary position. The war has somewhat delayed the prosecution of the Company's programme. But there has not been idleness during the past year. It has been devoted to the completion of the acquisition and transfer of various businesses embodied in the scheme, and in commencing the harnessing of large water power in Norway for the production of cyanamide. The capacity of the cyanamide works in Norway and Sweden controlled by the Company, through Nitrogen Fertilizers, Limited, is stated to be about 90,000 tons; but these works have only been kept in partial operation owing to the construction of new nitric acid works. Other items of information are that the process of distilling ammonia from cyanamide has been greatly improved, that granular nitrolim has been received by the trade and the farmers of the United Kingdom with marked approval wherever samples have been exhibited at agricultural shows, that there is a bad look-out for nitrate of soda in Norway, Sweden, and Denmark, and that the Company's emissary in India and Ceylon reports a good field for the use of the fertilizer in those regions. If words have real weight in this connection, those directing the Company's fortunes are confident that they will be able to hold their own against all competitors. Confidence is very helpful in a new business of this sort, where the competitors are already well established, and where one of the competing products is a secondary and not a primary one.

The Position of Nitrate.

Reports on the market for nitrate of soda in the past year are, of course, mainly concerned with the effects on the industry of the war. With Germany and Austria practically cut off, and Belgium and the north-eastern district of France over-run by invading armies, anything else than a very serious effect on consumption could not have been anticipated. Even outside the area which is immediately under the cloud of hostilities, the effects of the war are making themselves felt; a case in point being the United States, where the greater part of the consumption of nitrogenous fertilizers is understood to be for growing cotton, the market for which is completely upset. When peace is restored, there will be much leeway to make up; but for the present suppliers and consumers have to consider the influence of the enforced restriction of business. Of the quantity of nitrate afloat for Europe and Egypt at the end of the year, it is calculated that over 30 per cent. is in German vessels which are held up in neutral ports. This has all to be reckoned with, as it will certainly go into use, somehow and somewhere, at some time. Then there are large stocks in Chili—a consideration which is, however, somewhat off-set by the fact that tonnage is scarce. Unless, therefore, says Mr. T. Aikman, jun., in his report, some radical change takes place quickly in the shipping position, it is probable that the consuming markets still able to take nitrate may find it difficult to secure their early needs—especially as the quantity that is available is rather unequally and unsuitably distributed. Up to the outbreak of war, consumers generally had obtained very fair average prices; while since the war started there has been on the west coast of Chili a considerable fall in wages—a fact which, coupled with the low exchange, has, it is stated, substantially cheapened the cost of production. Latest advices, however, reported that only about 25 per cent. of the total number of oficinas were then producing. Statistics which have been compiled by Messrs. W. Montgomery and Co., indicate that the production since August has fallen off by no less than 50 per cent.; but, in spite of this, the output is still a great deal too much.

Points on Prices.

In the report of the last-named firm, it is stated that during August and September such low prices as from 7s. 9d. to 8s. per cwt. (cost and freight) were accepted for one or two arrived cargoes; but buyers were not successful in finding sellers who would entertain anything like these figures for cargoes to arrive in the season. This refusal of sellers has since been justified by an advance of over 1s. per cwt. which has taken place. It seems that this improvement was to a considerable extent brought about by a large demand from Russia, as well as from Holland and the Scandinavian countries, whose custom it has been to draw a big proportion of their supplies from Hamburg. Freights have advanced substantially; and besides this nitrate has had to bear the additional burden of insurance against war risks, amounting to from 7s. 6d. to 10s. per ton. The market, say Messrs. Montgomery and Co., closed steady at fully 9s. 1½d. per cwt. (cost and freight); marine and war risk figuring at about 7 per cent. Refined quality, being not over-plentiful, commanded a premium of some 10s. per ton. Prices in Chili, they remark, have fallen heavily, but are somewhat nominal; business, when done, having become merely a matter of negotiation. Producers, it may be imagined, are very hopeful that, when the war ceases, there will be a brisk demand, at enhanced values. Unless, in fact, there is a material advance in prices, it is felt that many of the oficinas which are now closed will remain so; while others, at present working on contracts entered into before the war, are likely to be added to the number, as the present price of something like 6s. per quintal does not in most cases warrant the continuance of production.

The Trade of Germany

One of a series of Diplomatic and Consular Reports (issued a few days ago) is on a subject which is just now uppermost in the minds of a great many manufacturers—the trade of Germany. The information, which is for the year 1913, has been edited at the Foreign Office and the Board of Trade, so that it should be accurate as well as ample. The report ought to be useful in assisting the student to understand to some extent the methods by which Germany has been building up and maintaining her huge export trade; and it will no doubt be quoted by those who regard the industrial achievements of that country as being better than any other, and also by those who do not. We are told first of all about combination, to which Germans in every stage of society are prone; there being "hardly a branch of manufacture or of trade, however special, which has not its own organization, and probably its own journal." Next there is syndication, by means of which production and sales are controlled, and when the home market is satiated, help is given towards directing merchandize abroad. Afterwards, there is concentration, which, "though it has been greatly assisted by the modern developments of German banking, is chiefly due to the application of science to manufacture." The result of the tendency to concentrate has been the creation of mammoth concerns, some of which "have ended by financially assisting the banks to which they had originally owed their own phenomenal rise." One example given of the steady process of concentration, which is being continued, is the taking over by a tube works of a sheet-iron works, as a step towards the eventual control of a complete line of production—coal, blast-furnaces, steel works, and tubes. The financial power to which the large works have attained is also being increasingly used for acquiring their own means of transport. The most recent development of all, however, is that, to guarantee a steady sale of their vast output, some of these big works have begun to effect a financial combination with their own consumers. For instance, the firm of Krupp have bought up two shipbuilding yards. Here is something for readers to ponder on: "During a boom, manufacture in a protected country seems more easily tempted to exploit the prevailing chances by a 'happy go lucky' extension of the existing works." In other words, "protection favours over-production." Then, in its turn, "over-production shortens the boom demand at home, and leads to forced export;" while "over-extensions curtail the supply of available capital."

And that of Britain.

Whatever may be the results at home of the German process of industrial expansion, the effects of this expansion on British trade have become fairly evident. Along with the report referred

to in the preceding paragraph, there may be considered a statement issued by the British Empire Industrial League, which is to the effect that the Germans and Austrians have secured a large portion of our trade, because they have produced the goods required here, and put them on the market in more attractive form and at a lower price than our own manufacturers. This is presumably the result of the "forced export" above alluded to, which, it seems possible, is nothing like so profitable to the exporters as it is damaging to the manufacturers against whom they compete. However this may be, the League regard cheap production as the key to the whole position; and they urge that the duty of all manufacturers is the adoption of every factor that makes for this, together with perfect attention to administrative detail, and adaptability to the requirements of actual and probable customers. Very much, of course, in the subject discussed is matter of opinion. But the suggestion is worth consideration that, as a preliminary to a re-arrangement and co-ordination of forces among British manufacturers and producers of all kinds (as well as the export merchants), the Government, associated chambers of commerce, consuls, and industrial experts should all confer, and, as far as may be necessary, take joint action as to the adoption of the most effective means of improving our methods of production—especially in regard to those industries in which foreigners have made the greatest inroads in our markets. The advantage of any steps which can be taken in this direction will be reaped with the arrival of the time—be it near or be it distant—when Britain will be faced again with a competition as fierce as, if not much fiercer than, anything that has heretofore been experienced.

PERSONAL.

In consequence of the removal of Mr. J. W. WHIMSTER to Bath, the Directors of the South Suburban Gas Company invited applications for the position of Works Superintendent. At their meeting last Friday, they appointed Mr. FREDERICK GORMAN, one of the assistants of the Saltley Gas-Works of the Birmingham Corporation, and late of Buenos Ayres.

The list of New Year's Honours contained the name of Mr. JAMES JOHNSTON DOBBIE, F.R.S., D.Sc., the Principal of the Government Laboratories, upon whom His Majesty the King has conferred a Knighthood. He was born in Glasgow in 1852, and was educated at the Universities of Glasgow, Edinburgh, and Leipzig. He was Professor of Chemistry at the University College of North Wales for nearly twenty years, and Director of the Royal Scottish Museum at Edinburgh from 1903 to 1909.

It will be remembered that about two months ago Mr. D. F. Colson resigned his position as Engineer and Manager of the Weymouth Gas Company, in order that he might be quite free to attend to his military duties as Commanding Officer of the Dorset Royal Engineers. The Directors have now filled the vacancy thus created by the appointment of Mr. THOMAS F. CANNING, who has been for the past seven years Assistant Engineer and Manager to the Ilford Gas Company. The successful candidate bears an honoured name in the gas profession; being the son of Mr. Thomas Canning, J.P., of Newport (Mon.).

OBITUARY.

The death is reported to have occurred on Nov. 11, in action at West Roosebeck, near Ypres, of Herr OTTO WINDEL, the Assistant at the gas-works at Wilhelmsburg-on-the-Elbe.

The death is announced, at the age of eighty, of Mr. GEORGE BROWN, who was for twenty-three years Secretary of the Belper Gas Company—a position he filled till the amalgamation of the Company with the Derby Gas Company. He was a lifelong resident in Belper, and held several public offices.

Midland Junior Gas Association.—At a meeting of the Association in the City of Birmingham Technical School next Saturday, Mr. F. Gorman, of the Saltley Gas-Works, and late of Buenos Ayres (who, by the way, is to be congratulated upon his appointment as Works Superintendent to the South Suburban Gas Company), will read a paper entitled "Carrying-out Constructional Work in Gas-Works."

Gas Testing by the London County Council.—Instead of the weekly returns which were for some years issued by the London County Council, giving the results of the testing of gas supplied by the Metropolitan Companies, there has been substituted a monthly summary; and that for November has lately reached us. It is signed by Mr. J. Ollis, the Chief Officer of the Public Control Department of the Council.

COAL SUPPLIES TO GAS-WORKS.

The Interruption to Railway Traffic.

WE learn from Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers, that a letter has been addressed to the War Office by the Institution calling attention to the serious difficulty which is being experienced by some gas undertakings in obtaining an adequate supply of coal and other materials to their works, owing to railway communication being interrupted.

The reply received from the Assistant-Director of Movements states that the Railway Executive Committee are taking the necessary steps to relieve the situation in the interests of all concerned adding that it will be of great assistance if consignees will make every endeavour to release trucks at the earliest possible moment after they are placed in position.

A letter on the subject from the Railway Executive Committee states that they are fully alive to the present situation, and are making every endeavour to ensure the maintenance of the coal supply to gas-works.

NOTIFICATION OF THE METROPOLITAN GAS REFEREES.

1915 Issue in Preparation.

THE Metropolitan Gas Referees intimate that, owing to the late publication of the Gas Light and Coke Company's Act of 1914, and the necessity, consequent upon it, of procuring and testing some new apparatus, their "Notification" for 1915 (which will provide for the changes in the testing of gas which the Act referred to involves) could not be issued by the 1st inst. They therefore certify that the prescriptions contained in the "Notification" for 1914 shall remain in force, with the exceptions stated below, until a new "Notification" has been issued by them and the apparatus prescribed therein has been provided.

Exceptions.

As to the Times and Mode of Testing for Illuminating Power.—The testings with the "Metropolitan" argand burner No. 2 shall not be made in the testing-places for the Gas Light and Coke Company.

As to the Mode of Testing the Calorific Power of the Gas.—The determination of the gross calorific power of the gas shall be made in all testing-places in the prescribed mode; but the result in calories per cubic foot shall be multiplied by 3·968, to convert it into British thermal units per cubic foot, in which terms it is to be returned in the daily report.

The determination of the net calorific power of the gas shall be omitted in all testing-places.

THE GAS INDUSTRY AND THE WAR.

The Co-Partnership Almanac for 1915 of the South Suburban Gas Company contains (under a portrait of the late Sir George Livesey) the following Directors' message to all the co-partners of the Company, signed by the Chairman (Mr. Charles Hunt): "The Directors feel that under present circumstances the most appropriate greeting they can send to all co-partners is the fervent hope that this New Year may witness the ultimate triumph of right over might, and be crowned with the blessing of an honourable and lasting peace. Meanwhile, our hearts are with the brave men who on sea and land are gloriously upholding—and more than upholding—the best traditions of both Services; while we deeply deplore the heavy losses substained in the defence of all that we hold most dear—the sanctity of home, liberty, and honour. The great debt which we owe to those whose names are inscribed on the roll of honour can never be fully repaid; but at least it is in the power of a grateful nation to make their dependants our care." Alongside the message is a list of members of the staff and workmen now serving with his Majesty's Forces in the war.

In their report to be presented to the Birmingham City Council to-day, the Gas Committee state that at the present time 535 employees of the department, including the Secretary and Manager (Mr. R. S. Hilton), are serving in the Navy and Army.

Some weeks ago, it was stated in the "JOURNAL" that the Manager of the Oude Tonge Gas-Works, in Holland, had been put into gaol, owing to his suspicious conduct, coupled with the fact that a bed of concrete was found on the works of sufficient thickness to carry heavy guns. It was then pointed out that the suspect was a German, and that the works were owned by a company having a Dutch name, which, however, was only a translation of the firm of "Carl Francke," of Bremen. It is now reported by the Amsterdam correspondent of "The Times" that the Manager (who was accused of violating the neutrality of Holland by espionage) has been acquitted and liberated, on the ground

that, though he communicated to the German Consul at Rotterdam, and to one Schnitzer, information concerning the movements of English torpedo-boats which he obtained from fishermen, he only related things known to everybody, and therefore conferred no advantage upon Germany, and did not place England at a disadvantage.

At the last meeting of the Edinburgh and Leith Gas Commissioners, a beautifully designed roll of honour was presented, containing the names of the Commissioners' employees serving with the Colours. There were 147 names in all. Lord Provost Inches, in expressing gratification at this fine rally, said he regretted that one of the men had already fallen—Private William Dick, of the Meter Readers' Department, who was killed in action during November. The Lord Provost complimented Mr. James Henderson, a draughtsman at the Granton works, upon his successful design of the roll of honour, and expressed the hope that there would be no further casualties.

An announcement was made in the "Journal für Gasbeleuchtung" of the 12th ult. by the Instructional and Experimental Gas-Works of the German Association of Gas and Water Engineers with reference to the straits in which some gas-works in Germany now find themselves in regard to obtaining supplies of gas coal. The experimental works has learned from various sources that descriptions of coal are now commonly offered, in lieu of the gas coals ordinarily supplied, which are either totally unsuitable or are of little value for gas-works' use. For instance, there was recently delivered to a German gas-works, as a gas coal smalls, a coal containing 30 per cent. of ash, which yielded a residue that could not be termed, or sold as, coke, since it was almost dust and barely useable in furnaces. The experimental works staff points out that a simple laboratory examination on a small scale will suffice to show in most cases whether a coal is fit for gas-works' use, and asks German gas undertakings to apply to it for advice in cases of doubt as to the descriptions of coal offered.

A supplement to the "London Gazette," issued just before Christmas, contained the text of a Proclamation declaring the following articles to be absolute contraband: Powder and explosives specially prepared for use in war, and ingredients of explosives—viz., nitric acid, sulphuric acid, glycerine, acetone, calcium acetate, and all other metallic acetates, sulphur, potassium nitrate, the fractions of the distillation products of coal tar between benzol and cresol inclusive, aniline, methylaniline, dimethylaniline, ammonium perchlorate, sodium perchlorate, sodium chlorate, barium chlorate, ammonium nitrate, cyanamide, potassium chlorate, calcium nitrate, mercury, resinous products, camphor, and turpentine (oil and spirit). Ferro alloys, including ferro-tungsten, ferro-molybdenum, ferro-manganese, ferro-vanadium, and ferro-chrome. The following metals: Tungsten, vanadium, molybdenum, nickel, selenium, cobalt, hæmatite pig-iron, and manganese. The following ores: Wolframite, scheelite, molybdenite, manganese ore, nickel ore, chrome ore, hæmatite iron ore, zinc ore, lead ore, and bauxite. Aluminium, alumina, and salts of aluminium; antimony, with the sulphides and oxides of antimony; copper (unwrought and part wrought) and copper wire; lead—pig, sheet, or pipe.

FINANCIAL RESULTS OF THE MUNICH GAS EXHIBITION.

The "Zeitschrift des Vereines der Gas- und Wasserfachmänner in Oesterreich und Ungarn" of the 15th ult. quotes from a Munich daily paper of the 6th ult. a report of the concluding sitting, on Dec. 5, of the directorate of the gas exhibition which was held at Munich last summer. Among members of the directorate who were present were the Ministerial President, Count Podewils, and the Minister of Commerce, Herr von Frauendorfer; but Count Hertling and many foreign members sent apologies for absence. The Chairman of the Directorate (Privy Councillor Pschorr) being in the field, Doctor Iodibauer presided at the meeting on his behalf. He called upon Councillor Bühler, the Treasurer, to present the final statement of accounts of the exhibition.

The guarantee fund had amounted to 311,500 marks (about £15,575), of which 50,000 marks had been guaranteed by the administration of the park in which the exhibition was held, and 25,000 marks by the Central Gas Publicity Bureau, which has its headquarters in Berlin. The receipts reached a total of 326,364 marks (about £16,318), of which 226,422 marks was for space, and 35,125 marks was taken at the doors. On the two last-named sums, a levy of 10 per cent. was paid to the Munich Corporation. Including this levy the expenditure amounted to 216,986 marks (about £10,849); leaving a surplus of receipts over expenditure of 109,378 marks (about £5469). About a quarter of this surplus is being apportioned as honoraria among officials, &c., 25,000 marks has been granted to the City of Munich Public Purposes Fund, 25,000 marks to the Central Gas Publicity Bureau, and 25,000 marks to the Administration of the Exhibition Park.

Councillor Bühler went on to remark that the exhibition had proved an immense success, which had amply justified the selection of Munich as the most suitable city for it. The whole German gas industry, both now and hereafter, would reap great benefit from it. It had been open for the four weeks of the original scheme, and but for the outbreak of war on Aug. 1 last would have been extended for a month longer. Minister Herr von Meinel, as representative of the Government, said that the King of Bavaria had been much gratified by the success of the exhibition, and, in addition to recognition of prominent members of the directorate, he had conferred the Order of Michael of the fourth class upon Herr Ries, the Manager of the Munich Corporation Gas Undertaking, and Herr Lempelius, the Manager of the Central Gas Publicity Bureau. Herr Lempelius expressed the thanks of the gas industry to the people of Munich and to the members of the Executive Committee for the support and work which they had given to the exhibition.

DAYLIGHT-SAVING IN HOLLAND.

The idea first promulgated in England, to bestow on mankind in the summer time the benefit of one full hour more sunlight at the cost of one hour of artificial light at night, has already a lot of friends in Holland.

The Dutch Society of Industry has (says a correspondent in the country) sent a notification to its members inviting them to discuss at one of the winter meetings the desirability of putting forward the clock one hour in summer, and returning in winter to the normal. The times of transit, it is suggested, should synchronize with the beginning of the summer services of the railways on the 1st of May, and of the winter services on the 1st of October. The difference of this proposal and the Daylight Saving Bill in England is, therefore, that the time-jumping would be made in Holland on one day, as against in the three periods proposed for England. Those who urge this semi-official proposal mention the general adhesion that the daylight saving proposal has found in England and its Colonies, as also in other countries. In opposition to the benefits to be received by the saving of one hour of artificial lighting during the summer months, there is the disadvantage that gas (and electricity) works will have to reckon with some slight decrease in their receipts. But as in Holland the far greater number of gas-works and of electricity plants are in the possession of municipal corporations, this financial point is perhaps of far less importance there than in England.

When calculating the cost of illumination in general as being 0·1d. hourly per head of the population, this means for the Dutch population of 6 millions a saving of £2500 daily, or in the 153 days of summer a sum of £382,500 to be taken into account.

But now, our correspondent adds, owing to the circumstances of the war, one of the Nestors of the Dutch gas industry has considered the daylight saving from another point of view. In one of the recent numbers of "Het Gas," Mr. Blom, the Director of the Haarlem Gas-Works, puts daylight saving on the same line with coal saving. Up till now Holland does not produce gas coal; and therefore the Dutch gas-works depend on the one hand upon the Westphalian and on the other upon the British coal supplies. So far all has gone well. Supplies from Britain are regular; supplies from Germany are also what may be called regular, but far below the normal quantity. So long as the scene of the hostilities is in the Belgian regions, there is nothing to be feared; but as soon as the troops of the Kaiser come to be beaten back by the forces of the Allies, and the fighting begins on German land, the first thing will be that coal supplies from Germany will immediately come to an end. Up to the present the Germans are obliged to export coal to Holland, in order to pay for their supplies of vegetables, butter, and meat from Holland. When coal supplies from Germany stop, this means no catastrophe for the Dutch gas industry, but it will only be necessary to carefully guard its stocks of coal; and therefore all means should now be taken into consideration that are capable of prolonging the supply of gas in precarious cases. "And so, perhaps," our correspondent concludes, "what in time of peace would have taken a long while, the insanity of war will perchance bring at once."

Radiation in the Gas-Engine.

Under the heading of "Heat Transmission by Radiant Energy," the following remarks appeared in the last Engineering Supplement to "The Times:" "In gas-engine work, radiation from the flame causes a loss of energy; but apart from this it is probably the main factor in determining the heat-flow to the cylinder walls, and necessitates the cumbersome cooling devices characteristic of gas-engine design. A few attempts have been made to determine experimentally the radiation during explosions in closed vessels which approximate to gas-engine cylinders. The amount of energy radiated depends in a very complex manner on many factors, of which the size of the cylinder, the composition and compression of the charge, and the temperature of the explosion flame are the most important. As an example of the order of magnitude of the heat loss incurred, an experiment by Hopkinson may be quoted. It was found that the heat radiated during an explosion (and subsequent cooling of the products of combustion) of a 15 per cent. coal-gas-air mixture in a cylindrical vessel, 30 cm. in diameter and 30 cm. long, amounted to about 22 per cent. of the total heat of combustion of the gas. This proportion could be materially decreased by highly polishing the interior walls of the cylinder, so that the radiant energy was reflected from the walls to a large extent, and not absorbed by them."

THE SOUTH GAS-WORKS AT AMSTERDAM: THEIR ELECTRICAL AND GENERAL EQUIPMENT.

By J. van Rossum du Chattel.

General Manager of the Amsterdam Municipal Gas-Works.

Introduction.

In the editorial article headed "Private Electric Plants on Gas-Works and Elsewhere," in the "Journal" for Oct. 20 last (p. 114), reference was made to a remark by Mr. Charles Hunt, in connection with his visit to the South Gas-Works at Amsterdam, that "he was struck by the fact that indicators are employed there for registering the expenditure in units of electricity for every operation." Not only did Mr. Hunt, on the occasion of his visit, tell me that he was struck with the electric plant on the works, but he also mentioned that they were the only works in which he had not detected the faintest odour of gas; and he spoke very highly of the cleanness noticeable everywhere. Similar courteous remarks may be applied, as a rule, to all new gas-works. Mr. Hunt's observations came into my mind when reading an article entitled "From the Log of the Velsa," by Mr. Arnold Bennett, in a number of the "Graphic" last August. In the course of it he said:

> Because it was the holiday week—the week containing the Queen's birthday—and we desired quietude, we obtained permission to lie at the private quay of the gas-works. The creators of the Hague Gas-Works have made only one mistake; they ought to have accomplished their act much earlier, so that Balzac might have described it—for example, in "The Alkahest," which has the best imaginative descriptions of Dutch life yet written. The Hague Gas-Works are like a toy—gigantic, but a toy. It is impossible to believe that in this vast, clean, scrubbed, swept expanse, where every bit of coal is scrupulously in place, real gas is made. To believe it, you must go into the city and see the gas actually burning. Even the immense travelling cranes, when at work or otherwise, have the air of life-sized playthings. Our quay was bordered with flower-beds. The workmen, however, seemed quite real workmen, realistically dirty, who were not playing at work, nor rising at 5.30 a.m. out of mere joyous ecstasy. Nor did the bargemen, who day and night ceaselessly and silently propelled their barges past us into the city by means of poles and sweat, seem to be toying with existence.

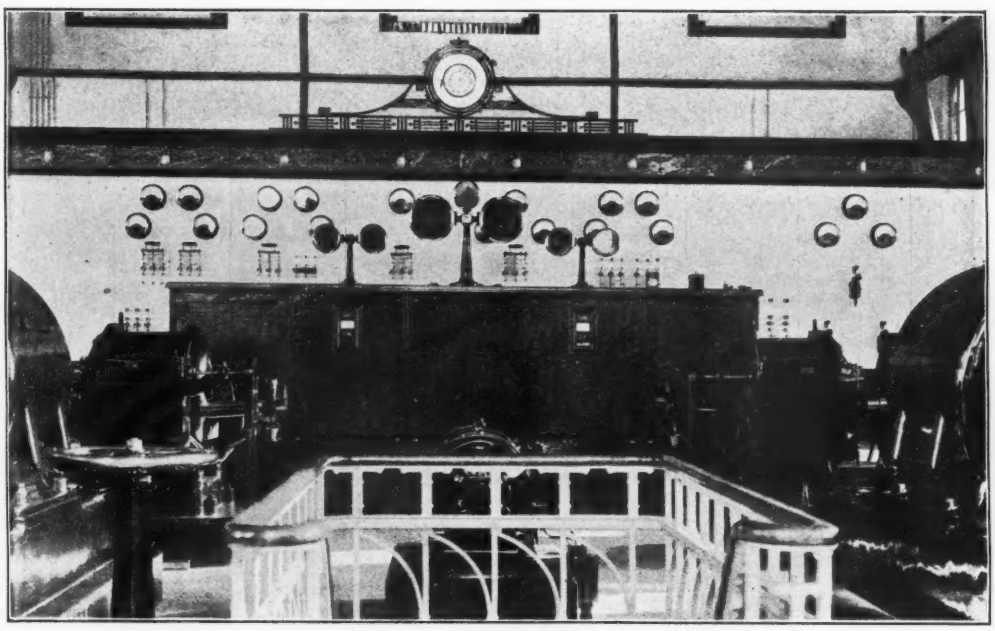
It may probably interest "Journal" readers to have a few details in regard to the South Gas-Works, especially as to the private electricity plant upon them. I will deal with this plant first. It may be mentioned that these works were brought into use on Aug. 10, 1913. A ground plan and some few particulars were given in the "Journal" for Sept. 24, 1912 (p. 810), on the occasion of the joint visit of English gas engineers to the International Gas Exhibition.

While the East and North Gas-Works obtain all the necessary electricity from the central municipal plant, the West works have, in addition, their own electricity plant; the current being generated by two De Laval turbines. It is only used, however, during the hours of maximum load on the municipal plant; at other times it is obtained from the works plant. The new South Gas-Works get their current partly from the same source, which supplies it at 3¾c. (¾d.) per K.V.A.-hour, on condition that at least 300,000 K.V.A.-hours shall be used per annum, with a maximum load of 100 K.V.A., and that during the time of the greatest load—*i.e.*, from 4 p.m. to 6.30 p.m. from Oct. 15 to Feb. 15, except on Saturdays and Sundays—no current is to be taken from the town cables.

Of course, the electricity plant in the gas-works is employed daily, as it is desirable to use the machines regularly to keep them in good working order. Experience has shown that the cost price of electricity generated in our own private plant does not differ very much from that of the current that is supplied by the municipal authority.

THE PRIVATE ELECTRICITY PLANT.

The installation of electricity plant at the South Gas-Works has been put up in accordance with the articles of Mr. H. C. Widlake;* and it may perhaps be of interest to describe it in some detail. It consists of two turbo-generators, on the Brown-Boveri-Parsons system, each of an effective capacity of 150 units, at 3000 revolutions per minute. They have surface condensation, with electrically driven rotary air and condensed water pumps. The steam-turbines are built as combination turbines. Each drives a three-phase alternating current generator of 150 units capacity at 3000 revolutions per minute, and is built for superheated steam of 440° Fahr. and 128 lbs. pressure per square inch at the stop-valve of the turbine. The cast-iron cylinders of the turbines with the ejection-tubes and guide-buckets are horizontally divided. The



INTERIOR OF THE ELECTRICAL POWER HOUSE.

turbines have steel spindles, the cushion-blocks are coated with a special metal, and have a cast-iron frame and a shaft driven by a worm and a worm-wheel. This shaft works an oil-regulator with a special device allowing the number of revolutions to be controlled by hand to about 5 per cent., and a valveless oil-pump and a safety device for automatically shutting-off the steam in case the normal number of revolutions is exceeded by from 8 to 12 per cent. In the event of an overload, a valve may be opened by hand, causing the working of an additional series of ejection-tubes. The turbines have different groups of these tubes, which are automatically switched in or out according to the load of the machines. All moving parts, with the exception of the stop-valves, are abundantly oiled from the central oiling device, and are totally insulated, but in such a way that all parts are easily accessible.

Alternating Generators.

The three-phase alternating generators are placed on the elongated frame of the turbines, and are built for producing rotary current of 220 volts and 50 periods per second. The capacity of each generator is 150 units load on inductive resistance, in which case $\cos \phi = 0{\cdot}8$. Therefore the electric capacity has to be 187·5 K.V.A. But this capacity ought to be attained at a pressure of 220 volts. The fall in pressure is not to exceed 8 per cent. when $\cos \phi = 1$, and 20 per cent. when it is 0·8. In order to ensure thorough ventilation, the generators are enclosed in a special building; 42 cubic feet of pure air per second per engine being necessary. Connected directly to each generator is an

* The articles by Mr. Widlake dealing with private installations of electricity plant appeared in the "Journal," Vol. CXXVI., pp. 119, 179, and Vol. CXXVII. p. 283.—Ed. J.G.L.

exciting dynamo of 60 volts pressure; and each turbo set is provided with pressure and vacuum gauges and other accessories. The condensers are made for utilizing sea water at 40° Fahr., and they are adequate for dealing with 2500 kilos. of exhaust steam with the sixtyfold quantity of cooling water. Under these conditions, they are capable of maintaining a vacuum of 95 per cent.

Pumping Plant.

The pumping plant is furnished with an air-pump and one for condensed water. The former is a jet apparatus, driven by water under pressure; and the latter is capable of raising the feed water to a pressure of 33 feet. The electro-motor for driving all the pumps is constructed for a rotary current of 220 volts and 50 periods, including switchboard and starting-switch. There is an automatic slide-valve with hand-wheel, arranged for being controlled from the working stage of the central plant.

Motor Generators.

There are two motor generators by Messrs. Brown, Boveri, and Co., consisting of one asynchronous three-phase alternating-current motor, with coiled armature and collector rings and brushes for a continuous capacity of 100 H.P. when the number of revolutions per minute is 975, with rotary current of 220 volts and 50 periods. This motor is connected with a direct-current compound dynamo for a continuous capacity of 60 units and a pressure of 440 to 460 volts at about 975 revolutions per minute. This capacity is attained at 440 volts. Each of these motor generators is delivered with a common bed-plate with three pillow blocks and automatic ring lubrication, with a rotor starting-switch for working without load for the motor and a shunt-regulator for the dynamo.

There is one motor generator of the same firm's make; also a spare exciting machine, consisting of one asynchronous three-phase alternating-current motor, with coiled armature and collector rings and brushes for a continuous capacity of 12 H.P. at 1450 revolutions per minute when driven with rotary current of 220 volts and 50 periods per second. This motor is connected to a direct-current shunt dynamo for a continuous capacity of 7·5 units and a pressure of 60 volts at 1450 revolutions per minute. The motor generator is fitted on a common bed-plate with three pillow blocks and automatic ring lubrication, with a rotor starting-switch for the motor and a shunt-regulator for the dynamo.

Switching Installation.

The switching installation for the generators and continuous-current transformers is totally separated from that for the feeders. The appliances for these are all on the feeder-board. The marble panels, nine in number, are fitted on a double framework of figured iron. On the back, plates of marble have been fixed where the safety devices have been arranged. The space under the marble panels is covered with curved sheet, bordered with figured iron. The upper side of the board is occupied by panels in coloured marble, on which are arranged ten brass brackets with small tulips, for lighting. The board has nine panels 3 ft. 3 in. wide, and also a closable sliding-door allowing the back to be accessible. On the front, in the centre of the board, there is a clock with decorations.

The appliances for the generators and continuous-current transformers, as well as those for the parallel switching, are controlled from the switchboard, which consists of an iron framework covered on all sides with curved sheets. These end at the under side in a heavy figured iron bar. The upper side of the board is occupied by a cast-iron sheet with nickel collars, in which the necessary holes are made for the measuring instruments, the switch-keys, and the lamps for phase and earth connection. The handwheels for controlling the oil-switch keys and the head current and shunt regulators are fitted on the front side, as are also the relay and the high-speed regulator.

In the cellar an iron frame is arranged on which are fitted the oil switches, the head current regulator, and the starting resistances. The latter have a three-pole starter switch that renders it impossible to make mistakes in the order of connecting the starter and the rotor. The measuring instruments are all of the electro-magnetic type.

The conductors between the switching installation and the generators in the central plant are armoured underground cables for a working pressure of 700 volts and an experimental pressure of 1200 volts. They have a double armouring of iron bands. The cable terminals are connected by rubber-covered compound wire with the connection bolts of the engines and the switching apparatus.

There are five switching-tables. On Nos. 1 and 5 are arranged the appliances for both motor generators of 60 units for each set; on Nos. 2 and 4, those for the turbo-generators of 150 kw. for each set; while No. 3 is furnished with starting and regulating apparatus.

The switchboard has nine panels. Nos. 1, 7, and 9 are spare; No. 2 controls the coke-handling plant; No. 3, the workshops, water-tower, store, and coke-loading plant at the harbour; No. 4, the lighting plant; No. 5, the boiler-house, central electric plant, air-fan, and high-pressure gas plant; No. 6, the coal-handling plant; and No. 8, the travelling cranes and telpher plant. The copper "bus-bars"—viz., two sets for rotary and one set for direct current—rest on porcelain insulators having specially cast caps.

THE EXTERIOR OF THE PURIFIER HOUSE.

The transformer, of 175 units (supplied by the municipal electricity plant), is connected to the bus-bar on the feeder-board by means of a band-iron armoured lead cable. All switches for the rotary current motors and the electric lighting are so arranged as to allow of their connection to the bus-bars of the central plant as well as to the town current; but the motor generators receive their current solely from the central plant of the gas-works.

Pumping Plant.

An electrically-driven circulating water-pump, consisting of a centrifugal pump adequate for a volume of 200 cubic metres (44,000 gallons) of water hourly at 1450 revolutions per minute, is arranged on a common bed-plate, and directly coupled to an asynchronous three-phase alternating-current motor by Messrs. Brown, Boveri, and Co., with coiled armature and collector rings for a continuous capacity of 20 H.P. at about 1450 revolutions per minute, and is driven with rotary current of 220 volts and 50 periods. The motor is made in normal open construction, with an automatic resistance for starting at full load with the auxiliary motor, so as to allow of the starting of the aggregate from the central plant.

There are two electrically-driven pumps for removing the exhaust water of the air-pumps, each provided with one centrifugal pump for a volume of 4 cubic metres (880 gallons) of water hourly, and a pressure height of 10 metres (32 ft. 9 in.) at about

970 or 1450 revolutions per minute. This pump is arranged on a common bed-plate, and directly coupled to an asychronous three-phase alternating current motor similar to the one already referred to, with short-circuit armature and six connectors for a continuous capacity of 2 H.P. at about 970 or 1450 revolutions per minute when driven with rotary current of 220 volts and 50 periods. The motors are made in normal open construction, with connecting-lines and switch-box with star-triangular combinator, amperemeter, and safety fuses.

Turbines.

The turbines work with condensation (the condensing water being at 39° Fahr.), and are guaranteed to consume the following amount of superheated steam at 132 lbs. pressure per square inch and 450° Fahr. at the stop-valve of the turbines; 23·8 lbs. per unit at 150 units load and $\cos\phi = 1$; 25·3 lbs. at 112·5 do.; and 28·6 lbs. at 75 do. For the estimation of the consumption of steam, the capacity of the motors for the condensing plant is not deducted from that of the turbines. When the temperature of the steam differs from 450° Fahr., the corresponding variations in the steam consumption are for 410° to 450° Fahr. + 1·6 per cent. for every 18° Fahr.; and for 450° to 480° Fahr. — 1·6 per cent. for every 18° Fahr. With a free exit for the exhaust steam and opened overload-valve, the turbines ought to develop 70 per cent. of the normal capacity with condensation.

Consumption of Electricity.

In the period from Oct. 1, 1913, to Oct. 1, 1914, the production of gas at the South Gas-Works amounted to 34,517,950 cubic metres (1219 million cubic feet). In the same period, the total current employed was 565,624 K.V.A.-hours, of which 276,587 K.V.A.-hours was supplied by the private electricity plant, and 289,037 K.V.A.-hours was drawn from the central municipal plant. Of the total, the following quantities were used for the motors driving the plant named:

	K.V.A.-Hours.
Coal plant—	
Telpher transporter	2,700
Cranes	14,200
Tipplers	2,850
Breakers	42,450
Conveyors	85,400
Elevators	37,050
Transport chains	85,500
Coke plant—	
Transport chains	99,450
Conveyors	19,850
Elevators	19,900
Sieves	8,400
Lifts	7,108
Loading-machines	2,850
Telpher transporter	7,108
Boiler-house	19,950
High-pressure gas installation and regeneration *in situ*	1,420
Electricity plant	11,300
Smithy	7,108
Carpenter's shop	1,720
Water-tower	85,500
Lift in store-house	570
Electric lighting	3,240
Total	565,624

The daily consumption of electric current amounts to about 1800 K.V.A.-hours.

In all buildings where there is danger of explosion, electric light is used. For driving the coal-tipplers, coal-breakers, transporter chains, conveyors, elevators, coke-loader, lifts, ventilators, centrifugal pumps, and various other machines, there are used three-phase alternating-current motors; and for actuating the cranes and the coal and coke telpher transporters there are employed closed continuous-current motors—making a total of 69 motors, having together a capacity of 716·6 H.P. The different machines used are specified below.

Coal and Coke Handling Plant.

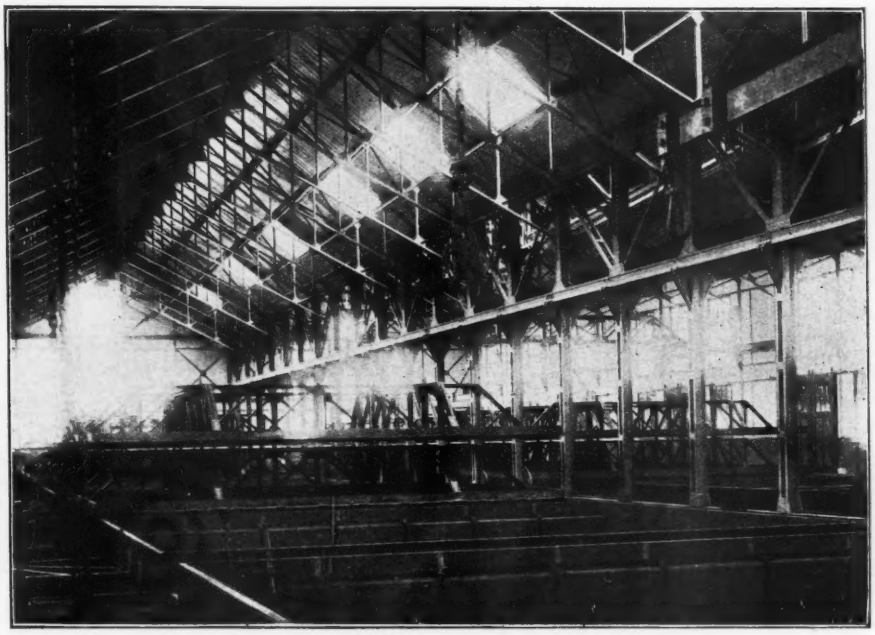
				Horse Power.	Revolutions per Minute.
2 cranes	each having	1	motor	30	900
2 tipplers	,,	,,	1	,,	6	975
2 coal conveyors	,,	,,	1	,,	20	980
2 ,, breakers	,,	,,	1	,,	20	975
2 ,, elevators	,,	,,	1	,,	10	965
2 transporter chains	,,	,,	1	,,	20	975
1 ,, chain	,,	,,	1	,,	4·5	970
4 coke transporter chains	,,	,,	1	,,	10	965
2 ,, lifts	,,	,,	1	,,	15	960
2 ,, conveyors	,,	,,	1	,,	20	978
2 ,, elevators	,,	,,	1	,,	10	976
2 ,, sieves	,,	,,	1	,,	3·6	1430

Exhauster-House.

High-pressure gas installation	having	2	motors	2	1410
Plant for regeneration *in situ*	,,	2	,,	1	1420

Central Boiler-House.

2 blowers	each having	1	motor	20	720
Soot-scraping economizer	,,	1	,,	2·5	940
Coke transporter	,,	1	,,	8	950



THE PURIFIER HOUSE INTERIOR.

Stokers' Dining-Hall and Bath-Room.

2 ventilators	each having	1	motor	0·2	—

Labourers' Dining-Hall.

6 ventilators	each having	1	motor	0·1	—

Smithy.

1 blower	having	1	motor	7·5	1450
1 air-hammer	,,	1	,,	10	965

Electricity Plant.

2 pumping-sets	each having	1	motor	7·5	3000
2 pumps	,,	,,	1	,,	1·5	3000

Carpenter's Shop.

1 carpenter's bench	having	1	motor	5	1440
1 circular saw	,,	1	,,	3	1435
1 turner's lathe	,,	1	,,	2	1425

Water-Tower.

3 centrifugal pumps	each having	1	motor	20	1450

Storehouse.

1 lift for goods	having	1	motor	7·5	570

Boiler-House for the Gasholder.

1 blower	having	1	motor	5	970

Coke Loading and Telpher Plant.

1 coke loader	having	1	motor	5	575
1 ,, ,,	,,	1	,,	5·4	725

There are three coke telpher tracks, each having two motors, one of 9 H.P. and 680 revolutions per minute for driving, and the other of 16 H.P. and 465 revolutions for lifting; and also three

coal telpher tracks, each having two motors, one of 9 H.P. and 680 revolutions per minute for driving, and one of 25 H.P. and 580 revolutions for lifting.

THE GAS-WORKS EQUIPMENT.

Retort-House.

In the retort-house there are thirty benches of eighteen Dessau vertical retorts, similar to those in the installation of the Imperial Continental Gas Association at Mariendorf.

Coal and Coke Handling Plant.*

The greater part of the electricity is used for the extensive coal and coke handling plant, which was erected by Messrs. Samuel Cutler and Sons, Limited. The coal may be brought in either by rail or by water. Coal arriving by rail is taken in the railway waggons direct to the tipplers, and discharged there into a hopper at the foot of the conveyors. Coal arriving by boat is unloaded by electric cranes and grabs into a travelling hopper, from which it is discharged into railway trucks, and passed forward to the tipplers in the same manner as that arriving by rail.

The nominal capacity of the coal-handling plant is as follows: Two electric cranes on the quay, each of a capacity of 40 metric tons per hour. They are provided with grabs of 1000 kilos. capacity, and have jibs capable of operating through a radius of 9 metres (about 30 feet). One travelling hopper on the quay, of 7 metric tons capacity. Two truck-tipplers, with supports and electric driving gear, each suitable for dealing with a railway coal-truck of 10 to 20 metric tons capacity. Two steel hoppers, one beneath each tipper. The hoppers are divided into two compartments, each equal to containing one waggon-load of coal, and provided with doors for discharging on to the tray conveyors. Of these there are two, extending from the hoppers under the tipplers to the receiving hopper at the retort-house. Each conveyor is capable of transporting 60 metric tons of coal per hour at a speed of about 20 metres (65 feet) per minute.

A steel plate receiving hopper, fixed upon suitable stanchions above the coal-breaker and below the head of the tray conveyor, has a capacity of 70 metric tons; and from it the breakers and telphers are supplied. There are two circuits of telpher track over the coal-storage ground, covering an area of approximately 215 metres (705 feet) in length and 60 metres (197 feet) in width. The track consists of rolled steel joists carried upon single web latticed trestles; the height of the track being 10 metres (about 33 feet) above ground level. There are three telpher transporters, each provided with one skip, capable of containing about 1½ metric tons, and one grab of about 2 cwt. capacity.

The coke-handling plant is so arranged that each kind of sorted coke may be separately transported in one of the following ways: To the storage ground situated to the north-west of the retort-house; to a bunker on the north of the storage ground, constructed to load into railway waggons; from the bunker to the north side of the port, in order to load vessels lying there; and from the storage ground to the bunker. Arrangements have been made whereby a coke-conveying plant can be installed at a later date, in order to convey the coke from the storage ground direct to the boiler-house.

The coke-handling plant consists of the following parts: Two hot-coke conveyors over the fourth storage bunker, of equal capacity to those working in the retort-house. One bunker below the conveyors, having a capacity of 53,000 cubic feet. Two tray conveyors beneath the storage bunker. They are similar to those for the coal-handling plant, receive the coke from the bunker above, and deliver it into the hopper of the coke-breaker. Their capacity is 30 metric tons per hour. Each conveyor is driven by a 16 B.H.P. electric motor, which also actuates the coke-breaker and works in connection therewith. Two coke-breakers, each capable of dealing with 30 metric tons of coke per hour, and fitted with cutters of special manganese steel. Two bucket elevators for the broken coke, of a capacity of 30 metric tons per hour. The coke as delivered from the breakers passes to the boot of the bucket elevators, which are constructed with steel buckets carried on steel chains and provided with tension gear. Each elevator is operated by a 5 B.H.P. motor, also actuating the rotary screen into which it delivers, and two sets of rotary screens and shoots, of a capacity of 30 metric tons per hour. The coke is delivered from the elevators to the revolving screens above the hoppers for sorted coke. They are constructed of perforated steel plates, strengthened by flat rings, and separate the coke into the four sizes, one being large. Two hoppers for assorted coke, installed beneath the screens and divided into four compartments with discharging doors and shoots for filling the telpher transporters.

There are two telpher circuits to the storage ground and to the bunker at the north of it. They consist of rolled steel joists carried upon single web latticed trestles; the height of the track being 38 ft. 9 in. above the ground level. There are three transporters, similar to those used for handling the coal, each provided with a skip of 1 metric ton capacity. A storage bunker for assorted coke, situated to the north of the storage ground, is of about 16,000 cubic feet capacity. It is divided into compartments to contain the coke of the four different sizes. The top of the bunker carries the telpher trestles, and its general position is such that it can be conveniently filled from either of the coke telpher circuits. There is an automatic coke-loader, consisting of a band conveyor mounted upon a strong travelling carriage. The coke, as discharged from the railway waggons, passes on to the belt through a feeding hopper, and is automatically dumped into the barges. The belt is provided with tension gear, and is driven by a 4 B.H.P. electro-motor.

THE MESS ROOM AND LAVATORIES FOR NON-STOKERS.

Boiler-House.

The steam is generated by five water-tube boilers; space for a sixth being reserved. The boilers have each a heating surface of 176 square metres (1895 square feet), and are constructed for a steam pressure of 10 atmospheres, and for firing with breeze. The maximum production of steam per boiler is ± 2500 kilos. per hour. The air for combustion is blown into a channel running under the boilers by a Sturtevant blower actuated by a 20 H.P. electro-motor; while a second blower is kept in reserve. The boilers are provided with superheaters, by means of which steam at about 75° C. can be superheated, under a pressure of 10 atmospheres, up to about 250° C.; also with an economizer of 360 square metres (3880 square feet) heating surface, and the necessary Worthington feed-pumps, water-meters, indicators, pressure-gauges, pyrometers, &c. Before the range of boilers there is the fuel-bunker, which is filled by an automatic transporter having a capacity of 30 tons of breeze per hour, and actuated by an electro-motor of 7 H.P.

Working Results.

The new gas-works have given entire satisfaction. Last summer, 240 retorts were in operation; while during the rest of the year the number was 360. Leaving out of consideration the first six weeks of their working, the results for the year ended Oct. 1, 1914, were as per table on next page.

The figures for coke production and for heating the retorts are probably so high on account of the specific gravity calculated for coke containing breeze and water being rather high.

The total production of tar at the South Gas-Works in the year

* Some illustrations of this plant were given in the "Journal" for Nov. 24 last, pp. 416-20.—Ed. J.G.L.

—	South Gas-Works.	West, East, and South Gas-Works.
Coal used . .	92,347,700 kilos.	262,403,700 kilos.
Gas made . .	34,517,950 cubic metres = 1219 million cubic feet = 37·38 cub. met. per 100 kilos. = 1320 cub. ft. per 100 kilos. = 13,400 cub. ft. per Eng. ton	84,476,210 cubic metres = 2983 million cubic feet = 32·19 cub. met. per 100 kilos. = 1137 cub. ft. per 100 kilos. = 11,550 cub. ft. per Eng. ton
Coke and breeze produced .	67,041,698 kilos. = 72·6 kilos. per 100 kilos. of coal = 737 kilos. per Eng. ton	188,516,123 kilos. = 71 kilos. per 100 kilos. of coal = 722 kilos. per Eng. ton
Coke used for heating retorts	19,247,670 kilos. = 20·84 kilos. per 100 kilos. of coal = 211·70 kilos. per Eng. ton	47,850,070 kilos. = 18·23 kilos. per 100 kilos. of coal = 185·20 kilos. per Eng. ton
Cost of handling coke . . .	31,813·06⁵ fl.	100,991·17⁵ fl.
Cost of handling coal (including engine-men's wages) . . .	37,011·50⁵ fl.	118,500·06 fl.
Firemen's wages	40,604·69⁵ fl. = 44·0 c. per 1000 kilos. = 44·7 c. (nearly 9d.) per Eng. ton of coal handled	304,289·11 fl. = 116·0 c. per 1000 kilos. = 117·8 c. (nearly 2s.) per Eng. ton of coal handled

under consideration amounted to 4,723,337 kilos. = 5·11 kilos. per 100 kilos. of coal handled (51·9 kilos. per English ton), while the total make of sulphate of ammonia was 1,029,248 kilos. = 11·14 kilos. per 100 kilos. of coal (113·2 kilos. per English ton). The average heating value of the gas (at 15° C. and 760 mm.) was 4915 calories per cubic metre, or equal to 552 B.Th.U. gross per cubic foot.

The cost of production over three-quarters of a year (Oct. 1, 1913, to July 1, 1914) amounted for the three gas-works to 1,861,363·06⁵ fl., with a total production of 83,301,503 cubic metres, or 22·34⁵ fl. per 1000 cubic metres delivered into the holder. For the South Gas-Works alone, the amount was 430,024·59⁵ fl., with a production of 26,611,330 cubic metres, or 16·16⁸ fl. per 1000 cubic metres into the holder.

ELECTRIC CURRENTS AND GAS AND WATER MAINS.

In an article contributed to the "Journal für Gasbeleuchtung" last year [Vol. 57], Herr T. Herrmann dealt with the corrosive action of electric currents on the gas and water mains in the town of Gablenz, Austria. According to an abstract of the communication in the "Journal of the Society of Chemical Industry," the origin of the earth currents is attributed to the electric tramways in the streets. These vagrant currents are assisted by impurities introduced into the soil through acids formerly discharged by factories in various places. The damaged pipes are for the most part situated under the tram rails, and cast and wrought iron tubes were equally attacked. In a large number of lead pipes, the metal was transformed into a brown powder, whereby serious leaks of gas occurred. The accumulation of gas led in one instance to a disastrous explosion. Especial damage has been caused at the gas-works, where many lines converge, through stray currents travelling along the pipes connected with the plant. The water conduits and oil-pumps were thus destroyed. Accidents also arose from the difference in potential existing between the earthed gas plant and the tram rails, which led to discharges between the two.

The disturbances at the gas-works have been obviated by suspending electrical traction altogether, and interrupting the metallic connection between the street mains and the works. This has been effected by the use of flanged joints, packed with layers of mica, between the pipes. This method, however, has introduced an additional danger on account of lightning discharges. Electrical charges concentrated in ground surrounding the works tend to pass along the whole length of pipes, as offering the path of least resistance to distribution in the earth. Currents thus tend to leap over the insulated section, and cause dangerous discharges at the metallic termini. The parasitic earth currents arise from the difference in potential—in some cases amounting to 20 volts—between the tram rails and the adjacent pipes; and these can best be minimized by lowering the potential. It is desirable, therefore, to increase the conductivity of the rails.

Before closing-down for the Christmas Holidays, on the 24th ult., the staff of Messrs. James Milne and Son, Limited, of Leeds, wishing to show their appreciation and esteem for Mr. W. D. Helps, the Director and Manager of the Leeds and London branches, made an interesting presentation to him. This took the form of a silver cigarette box, suitably inscribed. It was presented to Mr. Helps by the Assistant-Manager, Mr. S. Brook.

GAS BILLS FOR 1915.

[First Article.]

Without wasting time searching for a precedent, it may be safely said that, within our long experience of gas legislation, there has never been a session that has been without new or non-statutory companies applying for full parliamentary authority. We have a session before us now barren of all such applications; this, of course, being due to the general unsettlement occasioned by the war. This being so, entrance can at once be made upon the review of the Bills of existing statutory companies—only nine in all—who are in search of extended powers.

The Altrincham Gas Company desire additional capital and other supplementary powers. The total capital paid up is £114,812, the premiums received amount to £13,812, and there is now £5188 of 7 per cent. new ordinary capital under the Act of 1893 remaining to be issued. The total sum borrowed is £21,500. The Company now ask for power to raise additional capital to the amount of £60,000, of which not more than one-half may be issued as preference shares on which a dividend not exceeding 6 per cent. may be paid. It is desired that the borrowing powers shall be equal to a third part of the total issued capital. Clauses are included to provide for the appointment of a managing-director and professional auditors. The illuminating power standard is to go, and the calorific value one adopted on the lines of the provisions in the "Model Clauses." Apparatus and conditions of testing are to be those prescribed by the Metropolitan Gas Referees, which will include instructions for ascertaining the "total heat" value of the gas. The standard calorific power is to be 540 B.Th.U.; and there is to be the usual 7½ per cent. margin before penalties can be imposed—in short, in all respects the model has been followed. [See "Journal" for Nov. 10 last, pp. 279, 287.] A stand-by clause is included in the Bill, among the miscellaneous provisions. [*Parliamentary Agents: Messrs. Billing and Co.*]

With an increasing demand for gas, and for the general purposes of their undertaking, the Ascot District Gas and Electricity Company require additional capital authorization. The capital sanctioned under the Act of 1882 was £60,000 10 per cent. original and £15,000 loan. Under the Act of 1906, further capital powers were granted to the amount of £30,000, entitled to 7 per cent. dividend, with £15,000 of loan. The whole of the original capital has been issued and paid up; and of the 1906 capital, there remains to be issued only £255. The Company have borrowed (including premiums) £25,895. Now they ask for power to raise £35,000 by the creation and issue of new ordinary or preference shares or stock. Then we come to an interesting point. Touching the discussion that has been going on in our columns regarding the raising of capital by gas companies during the time that war influences continue to exist, it will be remembered that Messrs. R. W. Cooper and Sons, in the course of a letter, stated that, so far as they were aware, there was only one Bill in the ensuing session that proposed to do anything to enable the directors—at least to some extent—to overcome the difficulties referred to. In this particular case, the only provision the circumstances permitted was one giving relief from the auction clauses. Here we have that one Bill. The auction clauses appear in the usual form; and then there is this provision appended:

> Provided that the foregoing provisions of this section shall not apply during the period of five years from the date of the passing of this Act, or within such longer period as the Board of Trade may by order in writing sanction, which said sanction the Board of Trade are hereby empowered to give; and the Directors may during such period as aforesaid, or such extended period, as regards any capital required for the purposes of the undertaking, during such period create and issue such capital at such price, and on such terms and conditions, as they may think fit.

The dividend on the additional capital is not to be larger than 7 per cent. on the part issued as ordinary, and 6 per cent. on the part issued as preference. Regarding borrowing powers, the proposal is that the total amount, together with the sums already borrowed, shall not exceed in the aggregate £75,000; but "no sum shall be borrowed by the Company in excess of an amount equal to three-fifths of the paid-up capital of the Company for the time being." The Company ask for the establishment of a calorific standard and test—the conditions and apparatus used in the latter being on the lines of the prescriptions for the time being of the Metropolitan Gas Referees; and, of course, the illuminating power standard is to go. The standard is to be 540 B.Th.U.; and the penalty-line and all else are in accordance with the Model Clauses. Among other clauses in the Bill is one referring to profit-sharing, another exempting the Company from giving a supply from any main "for any other purpose than lighting or domestic use in any case where the capacity of the main is insufficient for such purpose, or if, and so long as, any such supply would, in the opinion of the Company, interfere with the sufficiency of the gas required to be supplied by means of such main for lighting purposes." As is now common, a stand-by clause appears. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Brighton and Hove Gas Company are asking for the extension of their limits of supply to the parishes of Botolphs and

Coombes in the rural district of Steyning West. In these parishes, the Company request the right to charge such price as they think fit, not exceeding by more than 1s. 3d. per 1000 cubic feet the price for the time being charged in the Company's inner area. Also desired is the liberty to charge in the parishes any price less than the authorized one, but not less than that charged within the inner area. A reserve fund clause in modern form follows; and then provisions as to the appointment of a managing-director. Succeeding are the following interesting clauses alluding to power to make donations, subscriptions, &c., and benefits to employees injured and dependants of employees killed, &c., in war:

> The Directors may subscribe or make donations to any fund raised in any case of national emergency, or to infirmaires or hospitals which are within the limits of supply for the time being of the Company, and to convalescent homes and to other institutions and objects, to any exhibitions, and to the benevolent and sick funds of the employees of the Company, and may for any of those purposes apply the funds and revenues of the Company.
>
> The Directors of the Company may grant such gratuities or make such pension or other allowance or payment as they may think fit out of the funds and revenues of the Company to any employee of the Company disabled, injured, or incapacitated while serving with any of His Majesty's forces in war, or, in the event of any such employee being killed in action or dying of wounds, injuries, or disease received or contracted whilst in such service, to the widow, family, or other dependant of any such employee.
>
> The Directors of the Company may enter into, and carry into effect, agreements with any insurance company, or other association or company, for securing to any such employee or the widow, family, or any dependant of any such employee, gratuities, pension, or other allowance or payment as aforesaid, and may make payments out of the revenues of the Company for that purpose.
>
> The Directors may, in addition to forming a benefit fund under the Brighton and Hove Gas Act, 1912, grant pensions and retiring or superannuation allowances to officers and servants (other than weekly servants) of the Company, and for that purpose may apply the funds and revenues of the Company.

The Company also seek power to purchase gas in bulk. Among miscellaneous clauses, provision is made for occupiers to pay the expenses of reconnecting discontinued supplies. A stand-by clause is also included, as well as one relieving the Company from the obligation to give a supply from a main for any purpose other than for lighting or domestic purposes, if such supply would interfere with the sufficiency of the service for lighting or other domestic uses. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Ilfracombe Gas Company desire additional borrowing powers, to have their illuminating power standard and testing changed to calorific value, and to be empowered to supply electricity for public and private purposes within the parish of Combe Martin. The Company are going on independent lines in connection with the calorific value clauses. The apparatus and conditions governing the test are to be those prescribed by the Metropolitan Gas Referees, including the ascertaining of the total heat value of the gas. But the Company appear to prefer a level standard without any margin as is usual, and as is provided for in the "Model Clauses." The standard is placed at 500 B.Th.U. If the result of the first testing on any one day is below the standard, then a second test is to be made, and the average taken. The penalties are on the usual lines, but below the standard value without the 7½ per cent. allowance. The sliding-scale of price and dividend is proposed, with a standard price of 3s. 8d. But provision is made under which the price to be charged by the Company for a supply of gas may be varied, according to the purposes for which the gas is supplied, as may be agreed upon between the Company and the person taking the supply, provided that the Company shall not give any preferential price as between any consumers who shall take a supply of gas for the same purpose under like circumstances. Included are a stand-by clause and one exempting the Company from the obligation to supply gas for any other purpose than lighting or domestic use when such supply would interfere with the latter purposes. Another is to enable the charging of the expenses of reconnecting a disconnected supply. The power obtained by the Margate Company last session in regard to making charges for special readings is included in the following terms:

> The Company may levy and recover such charges as they think fit for taking the reading of any meter fixed in a house which is either in whole or in part let furnished, at the request, and for the convenience, of consumers at times other than the Company's periodical readings—such charges not to exceed the sum of 6d. per reading.

Then follow the clauses referring to the supply of electricity to Combe Martin. As to the financial provisions, it is intended that all stock to be issued under the Act of 1896 shall be raised under the provisions of the current auction clauses. The standard rate of dividend on the consolidated ordinary stock is placed at 5 per cent., and on the preference stock the rate is not to exceed 5 per cent. As to the power to borrow, the Company desire authorization to borrow in addition to the loan of £4000 under the Act of 1872, any amount not exceeding £4641. Other clauses provide for the appointment of a managing-director and for professional auditors, for the making of superannuation and other allowances, and for the institution of a profit-sharing scheme. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Northwich Gas Company desire additional powers and generally to modernize their statutory authorization. By their Act of 1882, the original capital was fixed at £24,000, and sanction was then also given to the raising of £26,000 of additional capital. The whole of the shares in the original capital are fully paid up; and in regard to the additional capital, the Company have issued 2565 preference shares of £10 each, and have received £349 by way of premium thereon. By the Act of 1882, the Company were empowered to borrow sums amounting to £12,500; and they have borrowed £10,900. New lands and works powers are now sought, with the right to divert a footpath. The Company wish to extend their business operations to the parish of Weaverham. Clauses follow substituting calorific value and testings for illuminating power. As in the case of the Ilfracombe Bill, the standard proposed is the level one of 500 B.Th.U. (total heat value), without the 7½ per cent. margin. In regard to the sliding-scale, the standard price proposed is 3s. 9d., with variations in dividend in respect of any half year during which the price has been altered by one penny of 1s. 6d. per cent. The clause appears giving power to vary price according to the purpose for which the gas is supplied, as well as a stand-by clause. A number of provisions of now quite customary form succeed. Clauses are next included providing for the conversion of the existing ordinary shares into stock to the amount of £40,000, bearing a rate of interest of 6 per cent. per annum; the stock to be divided among the holders of the ordinary shares in the proportion of £25 for every existing ordinary share of £15. Power is asked to create such an amount of 6 per cent. stock, as from Dec. 31 next, as shall be necessary to give effect to the conversion. Additional capital to the amount of £45,000 is sought, to be also entitled to a standard dividend of 6 per cent., or not exceeding 5 per cent. on such part of it as is issued as preference. On the existing preference shares and ordinary stock, the Company seek the right to borrow (inclusive of sums already borrowed) £22,000, and up to one-third on the additional capital. Found among other clauses are provisions for the appointment of a managing-director and professional auditors, and the establishing of profit-sharing. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Ormskirk Gas Company are desirous of extending their wings under the designation of the Ormskirk and District Gas and Electricity Company. They are in need of new gas-works, desire an extension of their district to Parbold, and, among other things, they must have additional capital. Starting with an original capital of £20,000 under the Act of 1853, authority was given in 1892 to raise an additional £20,000. In respect of this latter sum, the Company have issued £1175 ordinary shares of £10 each, entitled to dividends at the rate of 7 per cent. per annum; and upon this they have received £5685 by way of premiums. Under the 1853 Act, £2000 has been borrowed; and under the 1892 Act a further £4335. There is nothing special in connection with the lands and works clauses, other than that we may compliment the Company upon adhering to the established principles confirmed by the Joint Committee of both Houses of Parliament in connection with residuals. In the construction and maintenance of works clause, there appear these words: "May on the said lands convert and manufacture, and may purchase, deal in, and sell, residual products resulting from the manufacture of gas." Calorific value is to be substituted for illuminating power. With a standard of 540 B.Th.U., the provisions follow the "Model" ones. The Company desire exemption from penalty or forfeiture by reason of the presence in the gas of sulphur compounds other than sulphuretted hydrogen. Many of the succeeding clauses are of normal form, or such as have been referred to in the notices of the Bills preceding this one. The area of the Company's electricity supply, it is proposed shall be the parish of Aughton. The electricity clauses are of ordinary character; but among them, it is noticed, the promoters take power to acquire by agreement already authorized undertakings. Provision is made for the sale (if desired) to the West Lancashire Rural District Council, after the expiration of ten years, of the electricity works in Aughton. To the same Council other protection is to be given. The additional capital sought is £45,000, of which not more than £20,000 is to be issued as preference. On the additional ordinary capital, the dividend is limited to 7 per cent., and on the additional preference to 6 per cent. In respect of the capital authorized by the existing Acts, the Company ask for power to borrow (inclusive of the £6335 already raised) the sum of £13,000; and on the capital to be authorized under the present measure, up to one-third. Stand-by, managing-director, and profit-sharing clauses are embraced. [*Parliamentary Agents: Messrs. Butterworth and Co.*]

The Bill lodged by the Prescot Gas Company is essentially a financial one, with the opportunity taken for obtaining powers of modern type, including calorific standard and test. Under their Act of 1867, the Company were authorized to raise 400 "A" shares of £12 10s. each, entitled to a dividend of 9 per cent., and 400 "B" shares of £10 each, entitled to a dividend of 7 per cent. In 1880, authority was given to the raising of £16,000; and this has all been issued as preference, at various rates of dividend not exceeding 5 per cent. The Company have also borrowed £6000. On the issue of the preference stock, premiums amounting to £120 were obtained; and by this sum the capital powers have been exceeded. The Company seek absolution for this small transgression. It is proposed that the 400 "A" shares shall be converted into 9000 consolidated ordinary shares of £1 each, bearing a dividend of 5 per cent. per annum, and the 400 "B" shares into 5600 similar consolidated shares. For each "A" share, the holder is to be given 22½ consolidated ordinary shares; and

for each "B" share, 14 consolidated shares. The promoters also require additional capital powers to the extent of £22,500, to be issued as consolidated ordinary 5 per cent. shares, or preference shares bearing a dividend not greater than 6 per cent. On the converted shares (inclusive of the money borrowed) the Company desire to borrow up to one-third part, and in the same proportion on the additional capital. The calorific value clauses in substitution of the illuminating power ones are on model lines—the standard being 540 B.Th.U. (total heat value), with a margin of 7½ per cent. before the penalty line is reached. Power of revision by the Board of Trade is provided, after the expiration of three years. Stand-by and other clauses are included in the measure. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Spennymoor and Tudhoe Gas Company, under their Act of 1876, had their capital defined as £12,500 original, and £37,500 additional; the dividends being respectively 10 and 7 per cent., and 5 per cent. on preference capital. Of the additional capital, the Company have issued 3750 shares of £10 each, in respect of which they have received £36,250, and £1250 remains to be called up. By way of premiums on the additional capital £1038 has been received. The Company have also borrowed £10,850, bearing interest at the rate of 4 per cent. per annum. Fresh land powers are now sought, with authorization to stop-up certain portions of streets. Further capital powers to the extent of £40,000 are desired—the part issued as ordinary to be entitled to a dividend of 7 per cent., and on that issued as preference not exceeding 6 per cent. The borrowing powers in respect of the additional capital it is proposed shall be on the usual lines of one-third. In respect of the existing capital (including the sum already borrewed), the same one-third proportion is contemplated. The Company are proposing a minimum pressure of 1 inch, instead of 8-10ths. Superseding the illuminating power standard is a proposal that the calorific value standard shall be—as in the case of two of the Bills already reviewed—500 B.Th.U. (total heat value) without a margin—power being provided for revision by the Board of Trade after the expiration of three years. A stand-by clause, and benefit fund and pension provisions, are among the miscellaneous ones. [*Parliamentary Agents: Messrs. Dyson and Sons.*]

By an Act passed in the third year of the reign of George IV., the Town of Warwick Gaslight Company were authorized to raise in share capital the sum of £12,000; and, if this were found insufficient, a further sum of £3000. This share capital has been raised, issued, and expended; and there has not been anything borrowed on mortgage. Since 1854, however, sums exceeding in the whole £28,000 have been taken from undivided profits, and spent in enlarging and improving the plant and undertaking generally. The Company have also provided out of undivided profits, and are now using, £3630 as working capital. The valuation of the Company's lands, works, mains, meters, stoves, lamp-posts, and services amounts to a sum exceeding £44,000. It is submitted in the preamble of the Bill deposited that it is reasonable the stock representing the sums so expended should be created and distributed rateably among the present proprietors. Furthermore, the Company are not at present subject to any restriction as to dividends; and the average dividends of the past fourteen years have amounted approximately to 14 per cent. Now, however, the expediency is suggested of the capital being converted, and the dividends restricted. Nor are the Company under any control as to the price or quality of the gas; and regulation is now sought. They also desire powers of works' enlargement and area expansion, with a change of name, and authorization to purchase the works of the Barford Gas Company (in liquidation). Turning to the clauses, the shortened title of the "Warwick Gas Company" is desired. In the general purposes clause, the Company properly desire power to purchase, manufacture, convert, supply, sell, and deal in all residuals resulting from the manufacture of gas. Regarding capital, the scheme is that the existing shares shall be converted into ordinary 5 per cent. stock to the amount of £56,000, to be divided among the holders of existing shares in the proportion of £186 13s. 4d. of ordinary stock for every existing £50 share in the original capital. Additional capital powers are sought to the amount of £30,000; and on any part of this issued as preference, the dividend is not to exceed 5 per cent. The Company ask for power to borrow, in respect of the ordinary stock into which the exising shares are to be converted, the sum of £18,666, and up to one-third part on the additional capital. Managing-director and professional auditors clauses are included. Lands and works provisions follow, and then a clause to empower the purchase from the Liquidator of the Barford Gas Company's undertaking. The limits of supply include the municipal borough of Warwick and specified portions of the rural districts of Warwick and Stratford-on-Avon. The proposal in regard to price is that it shall not be to persons other than prepayment consumers more than 4s. within a radius of two miles from the southern extremity of the Warwick gas-works' lands, and beyond that radius it is not to exceed by more than 1s. the price charged within the inner radius. Power, however, is taken to vary the price according to the purpose for which the gas is supplied. The calorific clauses provide for a level standard of 500 B.Th.U., without any margin. A stand-by clause, and co-partnership regulations are noticed among other miscellaneous provisions. [*Parliamentary Agents: Messrs. Lees and Co.*]

This concludes the review of the whole of the Gas Company Bills that have been lodged.

THE METAL TRADES IN 1914.

REVIEWS of the past year's operations in particular branches of industry, or trade generally, must of course be considered, and prepared, in the light of the abnormal conditions prevailing in the latter half. The period is not fairly comparable with the preceding year, or any other year that went before it. Really, it stands in a category by itself; and long may it remain so. Nevertheless, one may venture to assert that statistics of output and values, when available, will be as eagerly scanned on the present occasion as hitherto, if only to ascertain, as closely as such figures can indicate it, what has been the influence exercised on the country's business by five months' strenuous warfare among the principal nations of Europe. As each new year comes round, we are in the habit of turning to the review of Messrs. Bolling and Lowe, to see what has been the state of the metal trades during the preceding twelve months; and this time, though, for the reasons already pointed out, statistical comparisons are only valid so far as the first seven months of the year are concerned, there is useful information given with regard to the period that has elapsed since the war began.

The prosperity of 1912 was succeeded in 1913 by a time of falling prices and declining trade—a state of things which, indeed, continued down to the outbreak of hostilities. Then, as will be only too well remembered, came a period of great anxiety and uncertainty, owing to the danger zone into which the struggle had thrust financial conditions. Happily, however, serious disaster was averted; but an entirely new position had to be faced. A drastic alteration in the tide of the world's trade had, as Messrs. Bolling and Lowe point out, been caused by, on the one hand, the elimination of two most powerful competitors, and, on the other, the loss of a very important customer. Great hopes, they say, were entertained that the business lost to Germany and Belgium would be shared mainly by this country and in part by the United States. The harvest that was thus anticipated depended, however, upon the healthy financial condition of several other countries, who now appear themselves to be in an unsatisfactory position, so that little (if any) benefit from their trade has up to the present resulted. As to the earlier part of the year, iron and steel manufacturers experienced a slight increase in values and quantities of exports up to the end of March; but a continuous decline followed, until by July a conspicuously poor state of affairs had been reached. As a matter of fact, current quotations all through the spring and summer proved that for the majority of materials a low level of prices had been reached. In connection with the subject of values, attention is drawn to the curious fact that prices of many classes of iron goods and materials quoted in their report of January, 1871 [which was, of course, during the last Franco-German war], were not widely different from those now ruling.

Coming to specific materials, it is stated that prices of pig iron have shown very little variation since the commencement of the year; Cleveland pig having ranged between 48s. 6d. and 52s. 6d. per ton. Declining exports have been counterbalanced by a brisk home demand, and present prices seem likely to be maintained. With regard to steel rails, Messrs. Bolling and Lowe express some surprise at finding, upon analysis, that the returns show-up as well as they do. At no time was the price materially below £5 12s. 6d. per ton for moderate lots; while the present quotation is about £6 5s. to £6 7s. 6d. As to galvanized sheets, there is little which is encouraging to report. Exports showed a consistent decline; and trade was very poor most of the year, with, however, fairly level prices.

Copper, also, has experienced a troublous time. In February, the figure of about £67 per ton, for standard (cash) was touched; but this proved to be the best time of the year. From then onwards, a drooping tendency was witnessed. Reduced production everywhere followed the outbreak of war; and it was calculated that the output had, by the end of October, fallen off by fully 50 per cent. During the period of financial crisis, the price of standard copper (cash) went to £50 per ton, or even less; but it is, from the producers' point of view, at any rate, gratifying to learn that there has of late been a substantial and sustained recovery from this extreme figure, and that a large business has been done which has left producers in a fairly comfortable position. Tin has followed somewhat the course of copper; the highest price—about £188 per ton for standard, cash—was also reached in February. Disturbances caused by the war brought the figure down to some £120 a ton. However, with small supplies from abroad—owing largely to activities in a certain direction which have now ceased—coupled with a good demand, the market subsequently improved considerably, with a resultant shortness in supplies here, and a rather stringent condition of business. Users of tin may note the remark of the firm that "the consumption is certainly in excess of the rate at which metal has been coming forward for some months, and the stocks are down to a perilously low level."

The usual figures are quoted in the review relating to this country's exports of iron and steel, and their values, for the eleven months ending Nov. 30 of each of the past three years. The figures for pig iron are given as follows: Year 1912—1,180,900 tons, value £4,278,360; 1913—1,050,682 tons, value £4,535,759; 1914—748,986 tons, value £2,839,912. The total exports of iron and steel were: Year 1912—4,434,368 tons, value £44,279,332;

1913—4,569,637 tons, value £50,208,580; 1914—3,678,631 tons, value £39,373,157.

What is to be said as to the future? Certainly, little that is at all definite. The firm, however, point out that at present the iron and steel and kindred industries are fully employed, on work which may last for a considerable period. They look forward, when peace is restored, to four or five years of great prosperity, during which time the most must be made by our manufacturers and exporters of the opportunity to so consolidate their grip on the world's markets as to enable them to face the series of lean years which will probably follow.

COAL GAS RESIDUALS.

Few books devoted exclusively to coal gas residuals have been published in the English language; and although Mr. Wagner's work on "Coal Gas Residuals"* is an American book with American characteristics, it is one which will be very useful to British students of gas manufacture. The author reserves the subject of coke for a separate volume, but deals with tar, naphthalene, cyanogen, ammonia, and benzol, and gives special prominence to the different processes that were devised by the late Walther Feld.

The first chapter deals with tar. Descriptions and illustrations of centrifugal and other forms of tar-extractor are given, and the Feld method of condensing tar is clearly delineated. Instead of condensing all the heavy and light constituents of tar together, and then subjecting the mixture to secondary distillation, Feld avoids the secondary distillation by collecting the different constituents in a series of vertical centrifugal washers maintained at different temperatures. The tar leaving the hydraulic mains at a high temperature enters the first washer, which is maintained at 160° to 200° C., and in this the pitch is condensed. The second washer is maintained at 80° to 160° C., and in this the heavy oils are condensed. These heavy oils are used in the first washer as the medium for extracting pitch. The third washer removes the middle oils; and these middle oils are used in the second washer, and so on. The first illustration in the book shows a series of eleven Feld washers. The first five extract the tar, and the last six extract respectively the ammonia, cyanogen, naphthalene, and benzol. The whole series is, of course, intended for a coke-oven plant; for gas suppliers have not yet, as a rule, adopted the policy of recovering benzol at the expense of the quality of the gas.

Speaking of the secondary distillation of tar as usually accomplished, Mr. Wagner very rightly points out that the distillates differ largely in relation to the proportions in which they are present in the original tar, and says that "it becomes almost impossible to determine by computation how much of these primary constituents were contained in the gas based upon the amount of oils and pitch produced during the distillation of the tar." He might have omitted the word "almost;" for it is well known that apparently slight alterations in the conditions under which a tar is distilled by external heat result in considerable change in the volumes of the respective distillates, although the temperatures of distillation are apparently unchanged.

Referring to "free carbon" in tar, Mr. Wagner says that experiments in a number of cases showed that this is usually a brown-black powder yielding about 85 per cent. of volatile matter of an oily and rather heavy nature. Against this he quotes Behrens as having found free carbon from tar to consist of 91 to 92 per cent. of carbon, 3·1 per cent. of hydrogen, and 0·4 to 0·9 per cent. of ash. We have never before heard of free carbon from tar containing anything approaching 85 per cent. of oily matter, and our own observations of the properties of a number of samples of free carbon extracted from tar leads to the belief that the analysis of Behrens represents the usual composition of such free carbon. The free carbon is commonly regarded as consisting of partially carbonized coal dust mixed with tarry carbon produced by decomposition of some of the gaseous illuminating hydrocarbons; and if this mixture contains 85 per cent. of oily matter insoluble in benzene and similar solvents, it would be interesting to hear more concerning its composition.

The chapter on naphthalene is very short and is mainly occupied in describing the various forms of washer used for removing naphthalene from coal gas. The author quotes figures, obtained by Dr. Davidson, which show that 226 grains of naphthalene in 100 cubic feet of coal gas increases the illuminating power of the gas from 16 to 20 candles. Since coal gas as it leaves the holders seldom contains more than 6 grains of naphthalene per 100 cubic feet, it follows that the quantity of naphthalene in district gas is too small to materially influence its illuminating power. Nevertheless it is often said that when a deposit of naphthalene accumulates in a service pipe supplying a gas-testing station, the illuminating power of the gas in the testing-station is substantially lower than that in the street main. It is difficult to reconcile these statements unless the solid naphthalene deposited in the service pipe has the power of absorbing from the gas sufficient benzol and matter of a similar character to reduce its illuminating power. The author gives a table of saturation points by Schlumberger, which shows that at 50° Fahr. gas can only contain 6·7 grains of naphthalene per 100 cubic feet; while Allen shows that at this temperature it can contain 14·1 grains. In either case the quantity is too small to materially affect the illuminating power.

In the chapter on cyanogen the Bueb process, the Feld process, and the process introduced by the British Cyanides Company for the extraction of cyanogen, are described; but no mention is made of the important modification of the last-mentioned process devised by Mr. P. E. Williams, of the Commercial Gas Company. The British Cyanides Company introduced the process of extracting cyanogen in a washer charged with strong ammoniacal liquor and fed with granulated sulphur. The ammonium polysulphides formed in the washer readily absorb cyanogen to form ammonium sulphocyanide, Williams uses a purifier charged with spent oxide (containing at least 50 per cent. free of sulphur), which is kept moist by being periodically sprayed with water or gas liquor. The crude gas bubbles through the liquor from the oxide which collects at the bottom of the specially designed purifier; and this liquor is found to contain, in the form of ammonium sulphocyanide, practically all the cyanogen which was present in the crude gas. The whole of the sulphur required for the process is extracted from the hydrogen sulphide in the crude gas, and a considerable quantity of hydrogen sulphide, which would otherwise have to be dealt with in the ordinary oxide purifiers, is removed. The process has now been in use on a large scale for a considerable period at Poplar and elsewhere; and we recommend to the notice of the author the paper on the subject read by Mr. Broadberry in 1912. [See "Journal," Vol. CXX., p. 31.]

The author states that cyanogen has a corrosive action on all iron and steel with which it comes in contact. This statement is constantly being made in text-books and other publications, with the inference that it is much more injurious than carbonic acid. But what evidence is there to support it? The blue deposits on gasholders probably merely show that, after the iron has rusted, the cyanogen, in the form of hydrocyanic acid, has reacted with the oxide of iron to form prussian blue. Where lime purification is not in use, the gas in the holder contains a considerable quantity of carbonic acid. This is a stronger acid than hydrocyanic acid, and is present in much larger proportion. The corrosive action of carbonic acid upon iron in the presence of water and oxygen is quite well known. Place one strip of sheet iron in an open bottle containing a dilute solution of potassium cyanide, and another strip in an open bottle containing river or well water or distilled water impregnated with carbonic acid. Although the carbonic acid in the atmosphere will slowly decompose the cyanide, the strip immersed in the cyanide solution will corrode much less rapidly than the strip in water. Furthermore, all gas engineers know that when nodules of oxide of iron become coated with prussian blue, the inner portions of the nodules are protected from the attack of gases which would otherwise react with them. The conversion into prussian blue of rust upon sheet iron may, therefore, retard further corrosion of the metal. The subject appears to require further investigation.

Turning next to the chapter on ammonia, we find a description of most of the different methods of extracting ammonia from coal gas and of converting it into ammonium sulphate or into aqua-ammonia. The author speaks very hopefully of the Feld direct process, and says that if Feld's system of hot-tar extraction is included in the process there is no condensation, and the gas reaches the polythionate washers containing all the ammonia. He mentions that two Feld plants, each of three million cubic feet capacity, are being built in the United States at the present time. Little is said about the purity of the sulphate produced by the different processes. Some years ago objection was raised to the presence of traces of ammonium sulphocyanide in some sulphate which had been placed upon the market; but we have heard nothing concerning this lately.

Benzol is the last residual to be discussed. This is recovered from coal gas after the tar and ammonia have been removed, by contact with oils which dissolve benzol at normal temperatures and again release the benzol when heated to about 266° Fahr. Tar oils are usually employed for this purpose. The benzol recovered in this way includes toluol, xylol, and solvent naphtha. The quantity of this commercial benzol obtained per ton of coal amounts to about 2¼ gallons.

In the final chapter methods of testing gas for tar, naphthalene, ammonia, and cyanogen are described. A number of tables of the kind commonly found in chemical books are added at the end of the work.

The author has not dealt exhaustively with his subjects; but the book will interest every coal carbonizer who has a knowledge of chemistry, and should be supplied to the laboratory of every gas undertaking.

* "Coal Gas Residuals." By Frederick H. Wagner, M.E. The M'Graw-Hill Book Company, London and New York; 1914.

The Chesterfield Gas and Water Board have advanced the salary of Mr. W. T. Buckland, the Gas Manager, to £275 per annum, rising to £300 on Jan. 1, 1916.

It was mentioned in the "Journal" for the 8th ult. that Mr. James Fleming, the Treasurer of the Gas and Electricity Department of the Glasgow Corporation, had intimated his intention to retire, and that the Special Committee on Superannuations had recommended that he should receive a retiring allowance of £340 per annum. The Corporation approved of this at their meeting last Thursday.

ELECTRICITY SUPPLY MEMORANDA.

A Review of the Past Year.

Looking over the electrical affairs of the past year so far as they affect the gas-supply industry, the competing industry appears to have been to a large extent merely marking-time. Prior to the war, it had no doubt been, like the gas industry, gathering in additional business, but more in the power line than in any other; and since the war started, any enlargement of business has been practically confined to power in industrial areas beneficially affected by the terrible international conflict now being waged.

It has been a year full of lessons for the electricity supply industry. If it began the year with a swollen head, it has had plenty of reasons presented to it for allowing the protuberance to subside. Several electricity undertakings municipally directed have had to confess to a condition of financial instability, or losses on operation. Examples are Dublin, Bath, Redditch, Limerick, Middleton, Potteries, and Wednesbury. A lamentable state of things has been disclosed at some places—Wednesbury being notable. At Dublin, one critic likened the financial conditions of the electricity undertaking to "pouring sovereigns down a bottomless pit." At Limerick, the reasons assigned for a higher estimate for rates was the increased cost of the electric light undertaking. These are merely instances. They have their antitheses in the concerns that have made a respectable profit. But the accounts of municipal electricity concerns to March 31 last, and of companies for the first half of the year, showed a somewhat heavy depreciation of their working positions owing to the contract costs of coal and oil, and a general rise in labour and other expenses. Prior to, and even after, new contracts had been sealed for coal, there were undertakings that found good cause for raising their charges for electricity—generally to the lighting consumer. But this is not all. Things have not been going exactly as the industry could have wished in connection with its tariffs. The law has stepped in, and has informed the industry that it has been doing much, under the cloak of commercial expediency, that violates statutory conditions; and reluctantly the industry has had to acknowledge its transgressions, and to withdraw from the false position in which its administrators had placed it. Then it has had to be privately, if not openly, confessed that certain beautifully constructed tariffs also confer an undue preference on some consumers, and therefore do an injustice to others. It has also been admitted that the slow rate of influx of domestic business for purposes other than lighting shows that low tariffs and enormous savings of "meat" electrically cooked are not sufficient temptations.

The war, too, has brought home to the electricity supply industry that its extensive patronage of German produced electrical plant and goods over a long series of years has not only been unpatriotic, but has caused a large export of gold to the enemy, and has helped to line his war-chest with gold for the express purpose of fighting this country. It has also been a revelation to many in the industry that it has been harbouring within it a number of companies who were nothing more than agencies for German-made goods, as well as a number of concerns German capitalized, some with large and some with small works in this country, and some with so-called "works," which are nothing more than assembling and fitting shops for German-produced parts. If any industry has been well and truly permeated teutonically, it is the electrical industry, for which the whole topic has not been a savoury one. It has been exceedingly amusing to notice the efforts that have been made by certain of the firms supplying electrical goods to prove their British genuineness; while the files at Somerset House have, when referred to for confirmation, made disclosure of a discomforting nature. The industry having been large recipients of German-made electric-lamps, and depending so much on the arch enemy and Austria for carbons and glassware, have found the pinch a fairly acute one, though certain manufacturing companies (with a fine ability at advertising themselves) have been up and doing to accomplish as much as possible to meet the cessation of Continental supplies. Then the war has caused a large loss of custom—especially in the Metropolitan and Suburban areas—from that most generous of electricity consumers the shopkeeper, as well as from street lighting. On the whole, therefore, the cup of bitterness for the electricity supply industry has been full to overflowing.

There is very little that need be said here as to the generation and distribution of electricity—our interest being chiefly on the commercial side. Naturally the question as to gains in economy in generating expenses are, in a measure, material to the commercial aspect. But there does not seem any great chance of anything much better than now being effected. Turbine-driven plants are not making such a wonderful difference in costs. Technical observation has been turned upon the question of the adoption of bye-product recovery gas-producers and the use of internal combustion engines for reducing costs. In the report of Messrs. Merz and M'Lellan to the London County Council on the scheme for reorganizing the electricity supply of the Metropolis and its environment, they had within their view something of this sort; but there has been no further indication of the idea being pursued. Electrical visionaries, however, have been talking as though if the industry adopted bye-product recovery plants in connection with its generating systems, it would be conferring much benefit on mankind by providing a fertilizer for which the earth is supposed to be languishing. Those of us who have more intimate knowledge of the business know how already, without fresh intruders, it is difficult to make the demand for artificial fertilizers of equal span to the supply. Accrington is the only case of which we know of a public gas-driven electricity-generating plant, with bye-product recovery gas-producers. Its contribution, however, to the supply of fertilizers is but a drop in the ocean, and so no particular value as an object-lesson attaches to it.

The Question of Tariffs.

From the competition or commercial standpoint, the question of tariffs takes a distinguished place. The electrical industry rather wishes at the moment that it did not. It has been a very disagreeable ordeal through which it has had to pass, in being told that certain of its weak-kneed efforts to enfeeble the competitive position of the gas industry, by offering preferential terms, are such as the law cannot countenance. "Undue preference" given to power consumers who also took electricity for lighting, although other power users employing gas as an illuminant might be the more profitable power customers, was proved up to the hilt before Mr. Justice Sargant in the case brought at the instance of the Long Eaton Gas Company against the District Council; and the Court of Appeal showed all concerned its opinion of the appeal of the Council by dismissing it without calling upon the respondents. There are several electricity concerns that are affected by this decision; and shortly afterwards the South London Electric Supply Corporation and the Electric Supply Corporation, Limited, respectively withdrew their preferential charges in favour of those who used electricity solely for lighting throughout their premises, without regard to any other factors that should govern differentiation. In the South London case, a writ had been issued by the South Metropolitan Gas Company; but the Directors of the Electricity Company wisely accepted the Long Eaton decision. Another action is that against the Ilford District Council; this being also instituted by the Gas Company. This has not yet been heard; but a reference to it in Court indicates that it is likely that it will be agreed that one part of it comes under the Long Eaton judgment, while the other part may be a matter of settlement. If not, it is probable the case will be heard soon after the Courts reassemble next week. It is stated that there has been a whip-round among the electricity supplying municipalities of the country for funds for the "maintenance" of this case. Other of the tariffs by which the electrical industry seeks to do business are not innocent of showing preference to some consumers. We might instance the fixed price based on rateable value *plus* ½d. per unit of current consumed, under which a customer in a low-rated house may get a "corresponding supply"—"corresponding" in purpose of use and in quantity—at a lower price than the tenant of a house rated at a much higher figure. This, however, is the system that Sir John Snell recommended to the Southampton Corporation when reporting on their concern, in view of the fact that he could not discover any justification for a heating-rate of ½d. per unit, standing alone. At one part of the year, Mr. A. H. Seabrook was saying that a low price for current was essential for cultivating the heating and cooking business in competition with gas; and he mentioned ½d. per unit. Later on, he revised his opinion to this extent: Owing to the high price of electric cooking appliances, and the necessity of charging 15s. a quarter hiring rate for a cooker, which is a grave drawback, it was desirable, he intimated, to obscure some of this hiring rate by reducing it, and then indirectly realizing it through charging an additional ½d. per unit of electricity. In his presidential address to the Institution of Electrical Engineers, Sir John Snell protested against sensational prices being mentioned for electrical energy, and against charges being made which only take account of the generating costs, seeing that these merely amount to approximately 25 per cent. of the total costs.

All this goes to show the shallowness of the foundation upon which the Point-Fives have tried to erect their edifice. Few of them charge a flat-rate of 0·5d. per unit; generally it is that and a fixed charge. Still they have admitted freely during the year that a low price for electricity is not sufficient, and that something else is required to expand domestic business for purposes other than lighting. They almost all agree that they cannot trace any rush of business through the tariff which gives them the vaguely defined qualification to membership of the Point-Fives. They equally also agree that they must have cheap and efficient apparatus, which can be installed and maintained at small cost. But electrical apparatus does not lend itself to modest costs of any kind. Hiring and wiring powers are likewise desiderata. In short, electrical men want to put upon their undertakings a great financial responsibility in favour of the low-priced units, which for the erratic domestic load are, unless all charges are covered, the worst possible so far as any beneficial influence upon the undertakings is concerned. This is one of the lessons to be drawn from Sir John Snell's investigation of rates of charge under hypothetical ideal conditions. However, the Incorporated Municipal Electrical Association cannot yet get their Hiring and Fittings Bill out of its dormancy. This tantalized its prime movers into suggesting, at the annual meeting of the Association, that a Joint Bill should be privately promoted by the municipal undertakings that felt disposed to take part. Though rumour said such a

Bill would be promoted this session, there was no notice forthcoming at the regulation period. Certain municipally promoted Bills do contain clauses to give fittings and wiring and hiring powers; but the Electrical Contractors' Association (who by the way have not yet finally made their peace with the Sheffield Corporation) will be looking after those local authorities who are acting on the offensive this coming session in trying to obtain this extension into trading.

Lamps and Lighting.

There is not much to report this year in connection with lamps and lighting. The half-watt lamp has been kept in prominence; and, of course, electricians believed it was going to give a knock-out blow to high-pressure gas. It has done nothing of the kind. As a matter of fact, it is not quite so well with the half-watt lamp as was anticipated; and people have not taken to them so freely as it was imagined they would do. In the first place, the lamps have not an efficiency of 1 candle per half watt; and the blackening of the bulbs has not been altogether overcome by the ingenuity which added to the ugliness of their form. Their insufferable glare goes against them; and the necessity, in behalf of vision protection, for concealment in an envelope greatly depreciates the attributed efficiency. The first cost and the expense of renewals are not happy conditions. The only direction in which they have had real effect has been in deposing flame arc lamps; and the shortage of carbons since the war began has helped in effecting the change. Elaborate calculations have been made and published by the makers of these hostile electric lamps to show the position is in favour of their own particular productions. The price of the soi-disant 1000, 2000, and 3000 candle power "half-watt" lamps has been reduced variously from 5s. to 10s. apiece in making them range from 30s. up to 50s. each. Lower units were produced—200 and 400 candle power ones (50 to 65 volts), at respectively 15s. and 20s.; 400 and 600 candle power ones (100 to 130 volts) at 20s. and 25s. respectively; and 1000-candle power ones (200 to 260 volts) at 30s. The makers have not yet been able to get down to the domestic sizes; and there are physical obstacles in the way.

In connection with ordinary metallic filament lamps, the Municipal Electrical Association have objected to their markings showing both wattage and candle power. They prefer the wattage, with complete disregard of candle power. They are wise in their generation. But if metallic filament lamps have such consistency in efficiency as some people endeavour to make out, why raise objection to the dual marking? After much criticism, the Council of the Institution of Electrical Engineers have been roused from their lethargy, and are trying to improve the lighting of their lecture theatre, which has been a disgrace as an example of scientific illumination ever since the new home of the Institution was opened. At the same time, it would be highly appreciated if the Council would do something to prevent the stagnant-air condition of which members complain. Of similar conditions, complaint has been made in connection with the House of Commons. There has been further advocacy of concealed lighting in shop windows, particularly since the order for reduced lighting came into force as a consequence of the war.

There were in the course of the year some good contracts secured for public lighting by means of the newest forms of incandescent gas-burners. Reading is an example. There a contract was obtained for ten years, although the Corporation had had experience of electric lighting at Caversham. At Battersea, there was an interesting discussion on the subject; and there again gas lighting was held to be cheaper than electricity. At Altrincham the local authority applied to the Local Government Board for a loan for public lighting; but Mr. H. R. Hooper, the Inspector, criticized the Council, (not too severely) for not having considered any data bearing upon the relative costs and efficiency of incandescent gas and electricity. He found that at 2d. per unit electricity for street lighting would be much more expensive than gas at the price offered. The application for a loan was withdrawn. The folly of the Council's position in making application before becoming acquainted with the actual comparative facts, was keenly felt by some of the members. There was also an inquiry into an application of the Islington Board of Guardians for a loan for the purpose of installing electricity in their various buildings; but the estimates were proved to be so thoroughly unsound that the loan was refused. There has been a resuscitation of the question of electric lighting of workmen's dwellings. In connection with municipal artizans' dwellings, there is a sort of coercion or compulsion proceeding in some quarters—Finchley and Dundalk for example—under which the dwellers are not allowed to exercise any of the freedom so beloved by Britishers other than electricity suppliers as to whether they shall use gas or electricity. When municipal electricity departments have to descend to such arbitrary procedure, then it is time to consider whether municipal administration is not running mad. But altogether this cottage electric lighting business is an unhealthy one, and does not make much headway. At Wednesbury, the Council were so convinced that business on the help-yourself principle at a fixed price is altogether wrong and unprofitable, that they would not allow it to continue any longer. The Heston and Isleworth District Council also agreed that it would be better in connection with the "free-wiring" business to cut their losses, by writing-off all outstanding debt, and then to place any consumers remaining under this system on their books as ordinary customers.

Electric Cooking.

As already shown in dealing with tariffs, the domestic electric cooking business does not respond in any manner satisfactory to electrical men to all the effort put forward to advance it. Low prices for current do not help it; nor does the enormous saving in "meat" appear to catch on. But what is now perfectly well known among the public is that the electric-cooker has not the same range in convenience and economy as the gas-cooker, and that it is an altogether ineligible resident in the household. Only the other week, it was brought to our notice, in private capacity, that a new cook engaged by a public institution (where gas ranges are used) had according to her quondam employer, only one blot, upon her escutcheon; and it was that she could not live in amity with the electric-cooker. This is not very surprising when people financially interested in electricity, and known to us, cannot do so. Laboratory refinements in the kitchen, hesitancy in performing functions, costliness when they are performed, persistent unreliability, and occasional shocks to the cook are none of them aids to kitchen efficiency and felicity. Although supplemental consumption is badly needed by electricity undertakings in some residential areas, there has been confession that the electric-cookers are not all that they should be. During the year there have been published the results of comparative temperature experiments with lagged and unlagged electric-cookers; and the latter, despite highly polished side sheets inside and outside, show that they take longer to reach a given temperature than do the former, and that they show more alacrity in parting with the heat. It has been pointed out, too, that voltage variations disturb the efficiency of electric-ovens. There have been the usual banal attacks upon the gas-cooker; but they do not do any harm to the progress of this piece of structural simplicity and cheapness, notwithstanding the charging of lighting rates for the gas used in them. At Romano's Restaurant, an electric-grill was fixed during the year. Its advent was heralded with great delight in the electrical papers; and the fatty exudations of the chops that came under its treatment were credited with paying for the current used in the operation. Albeit, on the war breaking out, the electric-grill room at Romano's was promptly closed-down, and the sign of the "Electric-Grill" was removed. At the Brompton and Kensington Restaurant, after about fifteen months' use, much of the cooking apparatus that was originally put in was discarded in favour of new types. The scrapping so soon after installation in an expert supervised restaurant tells its own tale.

Electric Heating.

The most notable thing in electric heaters is that the manufacturers during the year have nearly all been keen about bringing out new designs containing heating elements in place of the old lamp-bulb radiators. But these new "fires" appear to possess much organic defect, quite apart from their uneconomy and their deficiency in heating capacity under the worst temperature conditions. In the heating element type of fire, the makers are generally producing them for a larger loading than the old lamp radiators. But the result is, of course, greater expense. It was reported from Southampton that new conditions had had to be imposed to stop the return flow to stores of electric radiators let on hire by the Electricity Department.

Water Heating.

One of the favourite hobbies of electrical men is to see how they can vary the design of electric water-heaters. Why they waste time in this fashion, except it be for lack of something more profitable to do, no one can tell. But waste time they do; and the result is that more electric water-heaters have, during the year, made their appearance with slight organic variations from their precursors. Fortunes are not made out of them, and never will be, seeing that a unit of electricity is not capable, however well-disposed the unit may be, of giving its purchaser more than 3420 B.Th.U. No commercial electrical or other water-heating apparatus has yet been invented with 100 per cent. efficiency. The longer, too, the time consumed to heat water, the greater the heat losses; and it takes a long time to heat water in bulk by the electrical methods. With electric appliances, the quicker the work is done, the greater must be the loading, the more complicated the apparatus, and the more expensive to construct. The electrical luminaries of Marylebone say that now water heating by electricity can be done as economically as by gas. It depends on the method of using the gas—whether it be properly or improperly used. The Marylebone statement, we emphatically say, is untrue applied to water heating by proper gas means. By no electrical system can water be heated with the same facility, and with the same economy of time and money, for any given quantity. An interesting feature of some of the claims put forward is an efficiency exceeding the theoretical. Nevertheless, water heating by electrical means shows a large amount of commercial inertia.

Wiring and Flexibles.

The year has brought its remonstrance to those who at one time were strong in their advocacy of cheap and exposed methods of wiring. Protests have been made against the cheap and nasty

wiring put into the middle-class houses of Suburbia—through competition, the cutting of prices, and the indifference of builders and contractors to the dangers of their work. Even high-class houses and buildings, litigation in the past year has disclosed, are not immune from defective wiring and its attendant dangers. For its medical staff and laboratories, the War Office erected a large building at Millbank; and it was desired to have put into it the best of electrical work. To this end, Messrs. Kirkland and Capper were appointed electrical consulting engineers, working in conjunction with Mr. Woodd, the architect. Trouble ensued when the buildings were brought into use; and electrical work not in accord with the specification was found. An action for damages for negligence against the Consulting Engineers resulted. They were found at fault; but the damages were limited to the cost of reinstating the installation in an approved manner. Incidentally, during the hearing of the case, there was a large amount of condemnation of the use of lead-covered wire. Mrs. Irene Osgood, the authoress, also brought an action against a West-end electrical engineer in regard to a defective electrical installation at Guilsborough Hall, Northampton; and she won her case. An investigation into the use of flexible wire has been made by Messrs. Melson and Booth at the National Physical Laboratory. Their principal conclusion is that it is desirable to periodically renew flexibles used for ordinary pendants and heating apparatus of any kind even before it presents any outward or visible sign of deterioration. In his annual report, Mr. G. Scott Ram, the Chief Electrical Inspector of Factories and Workshops, renewed his warning against the use of flexible wire, especially in connection with laundry irons.

Defamation of Gas, and Electric Lighting Defects.

Endeavours by electricians at defaming gas have been on the whole of a milder character than was at one time the case. Presumably it is recognized that the gas industry has made up its mind to take the matter more seriously, and to pursue effective measures against traducers. The "Electrical Times" during the year took the cowardly course of making quotations from incompetent authorities on certain subjects, and prefacing them with something to the effect: "This is not what we say, but what So-and-So says." On the truth of the matters being pointed out to our contemporary, it had not the grace or courtesy to withdraw, but allowed the printed aspersions to remain uncontradicted in its columns. "Meteor" of our contemporary once or twice did essay a little controversy; but he showed a remarkable agility when he found that cynical talk and superficial knowledge of the questions were unavailing. There was a statement in the "Textile and Engineering Notes" in the "Yorkshire Observer" as to the influence of flame arc lamps and incandescent gas-lights on the fading of the colours of materials. "Meteor" quoted the statement as to incandescent gas-lights, omitted that as to flame-arc lamps, and ignored altogether the drastic experimental work the British Commercial Gas Association have had carried out, and which disproves the allegations so far as incandescent gas lighting is concerned. The effects of high intrinsic brilliancy electric lights have been brought forward from time to time in the course of the year; and scientific information has been afforded as to the infra-red rays (which are not found in diffused daylight) being as harmful as the ultra-violet rays. Among suggestions advanced during the year for rendering electric lights innocuous has been the employment of specially prepared thin marble shades.

Accidents, Failures, and Fires.

It is impossible to get a complete record of accidents, failures, and fires due to electricity. The newspapers do not obtain cognizance of them all, and those that do come under their notice are not all recorded. There has been information published as to several explosions in electric conduits during the year; and, in this connection, there has been an inquiry by a Departmental Committee of the Board of Trade. The disastrous explosions at Nottingham and Hebburn-on-Tyne were the initiating causes of the inquiry; but, in the result, the Committee did not add much to the stock of knowledge on the subject. They found what was known, that from the bitumen covering of cables under certain electrical conditions gas of a violently explosive and poisonous character was generated, and that the same defective electrical conditions led to its ignition. The electricity supply industry was let-down as lightly as possible by the Committee, who made a few suggestions regarding new installation work on the distribution systems.

The roll of fatalities caused through contact with live wires was again extended; and notice was made of deaths at low voltages independent of, and in connection with, Mr. Scott Ram's report on the use of electricity in factories and workshops [see "Journal" for Feb. 10 and July 28]. Some of the voltages of the current causing death were in line with, or below, those of public supplies. Those interested in the question of fatal effects at low voltages will find additional information in the "Memoranda" for April 28. It was reported by Mr. Scott Ram that in factories during 1913 there were no less than 418 electrical accidents, of which 17 were fatal. In stations devoted to public electric supply, railways, and tramways, there were 65 accidents and one death due to electrical causes, and at other stations 29 accidents and one death. Commenting on the total number of accidents (well over 500), Mr. Scott Ram said that, though it was small—averaging not more than one in perhaps 100 works—"the conditions conducive to accident are present in a very much larger proportion; and in many works visited it appears to have been purely a matter of good fortune that accidents have not occurred." The question of the use of electricity in mines has received great prominence; more especially through the terrible happening at the Senghenydd Colliery, when some 439 lives were lost. Mr. R. S. Redmayne, the Chief Inspector of Mines, who held an inquiry into the catastrophe, said he could not get away from the view that the explosion and terrible loss of life were due to the sparking of a simple electric signalling apparatus. Several mine managers were summoned and convicted during the year for permitting the presence of defective electrical apparatus in the mines under their charge.

The failures of public electric supply recorded in our columns during the twelvemonth were: At Dundee, early in January about the same time in Paris, owing to the disturbed state of the employees; at Clydebank, early in the month, owing to the fusing of a wire; at Belfast, on Jan. 2; at Bridgewater, on Jan. 25; at Grangemouth about the same time; at Tunbridge Wells, on Feb. 6; at Dublin, on March 11; at Neath, on April 1; at Kingston, on April 2; at Worthing, on April 29; at Bray (co. Wicklow), in July; at Camborne, in July; in Terminus Road, Eastbourne, on Aug. 6; at Doncaster, on Aug. 24; at Bermondsey, in October; at Todmorden, on Oct. 28; at Gloucester, on Dec. 13. This happened on a Sunday, when inconvenience was caused in churches.

One difficulty of obtaining a complete record of fires due to electrical causes is that the electrical installations are usually destroyed or severely damaged by the fire. During the year, however, there have been a number of fires that have been directly attributed to electrical causes. In the report issued on the fires in the City of London alone during 1913, it was stated that sixteen of them were occasioned by defective electrical fittings. In connection with the recent order for reduced shop window illumination, and for shaded lights, warnings were issued against allowing contact of paper shades with electric bulbs; several cases of these catching fire having been experienced. Among the fires which report stated were electrically originated were these: Great Barton Hall, Bury St. Edmunds, was destroyed on Jan. 10, owing to, it was reported, a short-circuit. St. Mary's Church, Newport (Mon.), was imperilled at the end of March or the beginning of April. At Blackburn in April, there was a fire caused by the fusion of an electric wire near a gas-meter; but fortunately it was quickly extinguished. At Frascati's Restaurant, a fire was caused in the serving lift on April 22, through the fusing of a wire. At Parsons and Co.'s electric and turbine works, Gateshead, a fire occurred on April 25. Government House, Auckland, N.Z., suffered terribly on May 14; and so did the old German Church at Neuss, in Rhenish Prussia, on May 24. There was an electrically produced fire at Messrs. Christie's, King Street, St. James's, on July 6; at Perth, some £8000 damage was caused at a Cinema Theatre by two fusings of wires in July; and at a Huddersfield paper factory, at the end of July, damage to the extent of about £5000 was done The fire that occurred at the Greenwich generating station on Dec. 11, and stopped practically the whole of the tramway system of London for a couple of days, was one which illustrated the danger of too great concentration of generating plant, upon which public convenience and industry are largely dependent.

In Parliament.

There were no very noticeable electrical schemes in Parliament last session; but in the present one, the large project of the London County Council for the co-ordination of the electricity supply of London and its environs is shaping for discussion, and evidently for a sharp and resolute opposition. Another scheme (evidently an opposition one) is a new Company, with 6 millions of capital, to take over ten large London Electric Supply Companies, who are the promoters. The Yorkshire Power Company are going to ask for extended powers of supply for lighting and general purposes in areas not already covered; and this again is likely to tcreate somewhat widespread antagonism. These are matters to which more detailed reference has lately been made in the "Memoranda;" and the developments in connection with them form part of the electrical history which will be built-up in the year upon which we have now entered.

Swiss Association of Gas and Water Engineers.

The "Zeitschrift des Vereines der Gas- und Wasserfachmänner in Oesterreich und Ungarn" of the 15th ult. stated that the annual general meeting of the Swiss Association, which should have taken place towards the end of August last, was postponed on account of the war. It was held (merely for the transaction of formal business) at Berne on Oct. 18. Herr Burkhard, the Manager of the Lucerne Gas-Works, was elected President of the Association for the current year; and St. Gall was chosen as the place for the next meeting.

The late Mr. E. B. Ellington, the founder of the General Hydraulic Power Company, Limited, whose death was recorded in the "Journal" for the 17th of November last, left estate of the gross value of £15,551.

THE GAS CHEMIST'S HANDBOOK.

A PAPER bearing the above title was written by Mr. W. H. FULWEILER for the Chemical Section of the American Gas Institute at their meeting last October. It forms a voluminous communication of 118 printed pages; and the idea evidently is to gain information for the Institute's guidance with the view of publishing a handbook of standard methods of chemical analysis particularly adapted for gas-works' laboratories. There is a lot to be said for the idea; and it may be worth the attention of our own Institution.

The preliminary work consisted of a review of operations in, and analytical methods of, the laboratory of the United Gas Improvement Company. In the present communication notice is restricted to a few of the more important methods, and (where there is no recognized standard test) to the suggestions of the American Society for Testing Materials, the American Chemical Society, the Bureau of Standards, &c.

Of even greater importance than the choice of standard methods of analysis is the formation of standard methods of sampling. An index is given of the analyses likely to be required, together with a bibliography dealing chiefly with methods of sampling. While perhaps some of the methods of testing are peculiar to American conditions, most of them are of general importance; and for this reason it is proposed to mention briefly the methods given that are less generally known.

AMMONIACAL LIQUOR.

This is best sampled while being unloaded from the tank or tank-car. A pet-cock, with a nipple projecting about one-third of the diameter and of such a size that the sample will represent about 0·1 per cent. of the total liquor, is placed in the pipe line, and a continuous stream of the liquor run off into a covered container during the period of loading. The contents of the container are then stirred and a sample taken and placed in a heavy amber-coloured bottle closed with a red-rubber stopper. In sampling from a storage tank a simple and efficient apparatus may be made from a piece of 2-inch pipe provided with a lever-handle cock worked by an iron rod. In taking the sample the cock is opened, and the "thief" slowly lowered to the bottom of the tank. The cock is then closed and the tube withdrawn.

It should be noted that a "thief" sample does not represent the average contents of a horizontal cylindrical tank. It is possible, however, to get a fairly representative sample by dipping at different depths with a bottle provided with a cork, which can be withdrawn when the mouth of the bottle is at the required depth. The location of the sample points is taken as the centre of a zone. A final sample may then be made by taking from each of the separate samples a percentage equivalent to the percentage of the zone at the centre of each sample so filled by the liquid. Thus, assume a horizontal cylindrical tank, 80 inches in diameter, filled to a depth of 60 inches. Let five samples be taken by the bottle method at 6, 18, 30, 42, and 54 inches respectively from the top of the liquor. Call these A, B, C, D, E. Measuring now from the bottom of the tank, we would have the following:

Point.	Distance from Bottom of Tank. Inches.	Percentage of Total Depth.	Percentage of Total Capacity.
Top of tank	80	100·0	100·0
Level of liquor	60	75·0	80·5
Sample A	54	67·5	72·0
,, B	42	52·5	53·0
,, C	30	37·6	34·0
,, D	18	22·6	17·0
,, E	6	7·5	3·5
Bottom of tank	0	0·0	0·0

Each sample has now to be located at the centre of gravity of a zone in the cross section of the wetted part of the tank. Commencing at the bottom, this may be done by setting-off the boundaries of the zone at points that will enclose equal areas above and below the level of the sampling point.

Point.	Percentage of Total Capacity.	Capacity of Zone.	Percentage of Contents.	Amount in c.c. of the Sample to Make-up 5000 c.c.
Bottom	0·0	—	—	—
Sample E	3·5	7·0	8·7	261
Boundary	7·0	—	—	—
Sample D	17·0	20·0	24·8	734
Boundary	27·0	—	—	—
Sample C	34·0	14·0	17·5	525
Boundary	41·0	—	—	—
Sample B	53·0	24·0	29·8	894
Boundary	65·0	—	—	—
Sample A	72·0	15·5	19·2	576
Boundary	actual 79·0 to 80·5	—	—	—

This calculation can be greatly facilitated by the use of an ullage curve.

In completely filled horizontal tanks, bottle samples taken at the following percentages of the diameter measured from the top will represent equal areas, and will, therefore, have equal weights in the final sample. In analyzing the sample, the specific gravity is calculated from the Twaddel hydrometer reading, free ammonia by direct titration, and the fixed ammonia determined by subtracting the free from the total ammonia as determined by distillation.

Six Samples. Per Cent.	Eight Samples. Per Cent.	Ten Samples. Per Cent.
13·7	11·3	9·8
30·0	24·4	20·7
43·6	35·3	30·0
56·4	45·2	38·3
70·0	54·8	46·1
86·3	64·7	53·9
	75·6	61·7
	88·7	70·0
		79·3
		90·2

ANALYSIS OF COAL AND COKE.

Besides a proximate and ultimate analysis, a determination is made of the calorific value, apparent and real specific gravity, and the percentage of cells and wall (in coke). Accuracy in reducing gross samples of coal to a quantity convenient for transmission to the laboratory is largely dependent on thorough mixing and crushing the extraneous impurities of slate, pyrites, &c., to such a degree of fineness before each quartering that the inclusion of a few pieces more or less in the various divisions cannot materially change the character of the final sample.

The quantity of sample to send to the chemist will be governed by the relative proportion of free impurities, and the practical limits of fineness to which these impurities can be crushed at the point of sampling. In cases where it is not feasible to crush to 4-mesh in the field, the weight of the sample sent to the laboratory must conform to the following.

Size of Largest Impurities. Inches.	Minimum Weight of Sample. Lbs.
½	75
⅜	30
¼	9
⅛–⅓ (4 mesh)	5
0	3½

The sample must always be enclosed in an air-tight tin. The method of preparing a suitable sample for the various analytical determinations that are required in coal analysis must conform as nearly as is practicable to the following requirements: (1) A uniform distribution of coal and impurities must be maintained throughout the process of reducing to the final powdered sample. This should be insured by thorough mixing between each dividing or quartering process, and by having due regard to the ratio of size of the largest impurities and the weight of the sample as given in the preceding table. (2) Unrecorded changes in moisture during the procedure of sampling must be reduced to a minimum. Full directions are given for avoiding loss or gain of moisture. These are to be found in any good text-book; so that their inclusion here is not necessary.

As to the actual determination of moisture, use a pair of shallow weighing capsules with ground caps or other well-fitting covers. Heat these under the conditions at which the coal is to be dried, stopper or cover, cool over concentrated sulphuric acid for 30 minutes, and weigh. Then dip-out with a spatula two portions of coal of about 1 gramme each, put quickly into the drying vessels, close, and weigh immediately. They are then placed open in an oven preheated to a temperature of 104° to 110° C. (219° to 230° Fahr.), through which passes a current of air dried by sulphuric acid. Heat for an hour, cover the capsules quickly, allow to cool in desiccator over sulphuric acid, and then weigh.

Allowable Variations.

	Same Analyst. Per Cent.	Different Analyst. Per Cent.
Moisture under 5 per cent.	0·2	0·3
,, over ,,	0·3	0·5

DETERMINATION OF VOLATILE MATTER.

Two methods are given; but as the simpler appears the more efficient, that is the one chosen for notice here. It is recommended that a 10 gramme platinum crucible be used, having a capsule cover, or one fitting closely enough so that the carbon from bituminous coals does not burn away from the under side. The cover should fit inside the crucible. The crucible containing 1 gramme of coal is placed for 7 minutes in a muffle maintained at 950° C. (1742° Fahr.). With a muffle of the horizontal type the crucible should not rest on the floor of the muffle, but should be supported on a platinum or nichrome triangle. After the more rapid discharge of the volatile matter, well shown by the disappearance of the luminous flame, the cover should be tapped lightly, to more perfectly seal the crucible, and thus guard against the admission of air.

Allowable Variations.

	Same Analyst. Per Cent.	Different Analyst. Per Cent.
Bituminous coals	0·5	1·0

Determination of Ash.—One gramme of coal heated very gently at first by placing the porcelain crucible just above the top of a 2 to 3 inch bunsen flame, with frequent stirring of the contents. When most of the carbon has burned off, the heat is increased to low redness. The crucible is then transferred to a muffle heated to 700° to 750° C. (1292° to 1372° Fahr.). From 20 to 30 minutes will ordinarily be required for the first part of the process; while 10 minutes should be ample for heating in the muffle. Correction

can be made for the sulphur vaporized from the iron pyrites; but in technical analysis this is unnecessary.

Determination of Sulphur.—For this, Eschka's method is given. The directions given for carbon, hydrogen, and nitrogen (Kjeldahl-Gunning) are those generally employed. Oxygen is found "by difference;" but when a more accurate value is desired, it may be obtained by the following correction:

$$V = 100 - (C - C^1) + (H - h^1 + N + H_2O + S^1 + \text{corrected ash})$$

in which

V = corrected oxygen.
C = total carbon.
C^1 = carbon of carbonates.
H = total hydrogen less hydrogen of water.
h^1 = hydrogen from water of composition in clay, &c.
N = nitrogen.
H_2O = water at 105° C.
S^1 = sulphur not present as pyrite or sulphate. In many coals this may be neglected.

Calorific Value.—Some form of bomb calorimeter is recommended (with the exception of the Parr instrument). To find the true specific gravity, the coal is placed in a 50 c.c. pycnometer, with 30 c.c. of water, heated, and evacuated to expel air as usual.

Gas Analysis.

For benzol a modification of Pfeiffer's method is given. It is based on the reaction:

$$NO_2 + 3SnC_{12} = 6HCl = NH_3 = 3SnCl_4 + 2H_2O.$$

The gas is treated in a glass separating funnel of known content, the stopper and tap of which have been lubricated with a drop of H_2SO_4; the gas being allowed to blow through the apparatus for two minutes. The cock is then momentarily opened to reduce the gas to atmospheric pressure, 2 c.c. of a mixture of equal parts of concentrated H_2SO_4 and HNO_3 are admitted, and the apparatus is then set on one side for an hour to allow absorption of the benzol vapours. There are then added 30 c.c. of concentrated NaHO, and the vapours set free are absorbed by shaking. The solution is next neutralized by weak HCl (change of colour from orange red to wine yellow being a sufficient indicator), extracted twice for 5 minutes with 50 c.c. of ether, separated from the other nitro products, and then put into a flask containing 1 gramme of potash and 0·5 gramme of finely-powdered animal charcoal, and shaken to take out the yellow-red colour.

The solution is now filtered into a 200 c.c. graduated flask, washed with absolute ether, the latter evaporated off, 10 c.c. of absolute alcohol and about 10 c.c. of a stannous chloride solution [150 grams of tin in 50 c.c. of HCl, made up to 1 litre] added, and the flask warmed for 10 minutes on the water bath. The flask is now filled to the mark with water, and then 20 c.c. taken and titrated with $\frac{N}{10}$ iodine, using starch indicator. A blank is run with 10 c.c. of $SnCl_2$ solution, 10 c.c. of alcohol diluted to 200 c.c., and 20 c.c. titrated. The difference between the two titrations gives the value of the dinitrobenzol: $10 \times 0{\cdot}0014$. One gramme of the dinitrobenzol = 0·4643 gramme C_6H_6 and 1 gramme $C_6H_6 \doteq 279{\cdot}2$ c.c. at 0° C. and 760 mm.

For the general analyses of gases Hempel's apparatus is to be recommended; the gas being measured over mercury. Oxygen is absorbed by phosphorus, hydrogen determined by combustion, C_2H_6, CH_4 by explosion.

(To be continued.)

PURIFICATION, FILTRATION, AND STERILIZATION OF WATER SUPPLIES.

The extension and deepening of knowledge in general—accompanied as it must be by a rapidly accumulating mass of detailed information—is, in every profession, steadily reducing the area of that "something" about which a man is supposed to know everything. Fortunately for the individual, there is at the same time some compensation provided by inventions and discoveries which show the inter-relation of all branches of science, and provide new and varied opportunities for the application of the individual man's exact knowledge. The resulting inter-dependence of the different professions and callings is becoming so marked that it would be difficult, if not impossible, to delimit the frontiers between them. Nowhere is this more apparent than in those spheres which, not so very long ago, were looked upon as the undisputed territory of the engineer.

Most of us can remember when the engineer who devoted himself to water supply was not only expected to design the necessary works of collection and distribution but was also looked upon as the proper authority to determine all questions connected with pollution and purification. That time, if not entirely past, is now quickly passing; and it may perhaps be looked upon as evidence of this that there has recently been published a book on water supplies, written by a Doctor of Science and a Fellow of the Institute of Chemistry in collaboration with a Bachelor of Arts and a Doctor of Philosophy.*

Nowadays there is probably no one, not even among those who are most jealous of any encroachment on the position of the engineer, who is likely to contest the importance of the chemist and bacteriologist in all questions of the pollution and purification of water. If there is such a person, a perusal of this book should result in a radical alteration of his opinions. As the title of it, "Water Supplies"—instead of the more usual "Water Supply"—together with the names of the authors, might lead us to expect the subject is treated in its fundamental aspect as a question affecting the public health. The bearing of engineering considerations is not ignored; but where these are likely to exercise a determining effect on the use or development of any process, the fact is pointed out; the detailed discussion of such matters being left, as is right, to those whose business it is to deal with this side of the question. The bulk of the book is, therefore, devoted to such subjects as the composition and analysis of waters, their suitability for various purposes, pollution, purification, and the processes connected therewith.

For a long period there was a general belief that the only way of providing a really satisfactory water supply was to obtain it from an unimpeachable source; and enormous sums have been spent by some of our large towns to annex such sources and maintain them free from pollution. In a thickly populated country, however, sources of this kind are comparatively scarce, and are seldom conveniently situated. Much attention has, in consequence, been given to the possibility of providing a reasonably safe supply from sources not in themselves beyond suspicion. The discovery of the action of micro-organisms in natural purification, and the true principles involved in filtration and other processes, showed that this was not a hopeless quest; and it is probably not too much to say that the utilization of what would formerly have been regarded as unsatisfactory sources, has of recent years been the dominant characteristic of progress in water supply. At the same time absolute safety is hardly to be reached except by complete sterilization, which would seem to be the only method of rendering a water absolutely safe for potable purposes. As the authors say: "As an axiom, there is no safe method of preventing water-borne diseases, except sterilization of the liquid."

The discovery of the sterilizing effect of ozone and of the ultra-violet light rays, which do not add any permanent chemical substance to the water, has certainly brought this desirable consummation distinctly nearer. The difficulty in the way is largely a question of cost. Whether this can be met (as the authors appear to think) by a dual supply—that is, a sterile supply for domestic purposes only, and one purified by storage for other purposes—is a very controversial question, but one certainly which is worthy the most serious consideration.

The authors have admirably set forth the present state of our knowledge in regard to all these matters, and of many others—such as the corrosion of pipes and the treatment of waters for industrial purposes. They have very carefully explained the problems to be solved and the principles on which the various solutions are based; while, in addition, the most important processes are described in detail. We may also congratulate the authors that they do not consider it necessary to be dull in order to be serious. Occasionally, points are illustrated by examples drawn from unexpected sources. One, even, is taken from Exodus xv.:

> And when they came to Marah, they could not drink of the waters of Marah, for they were bitter. . . . . (v. 25) And the Lord showed him [Moses] a tree, which, when he cast it into the waters, the waters were made sweet. [v. 23]

And the probable cause and remedy are explained.

It is among one of the minor ills that afflict the professional man that so many technical works appear either to have been written by those who have more present spare time than past experience, or, when the experience is indisputable, with too little time or literary ability to present the matter in an attractive form. It is, therefore, all the more pleasant when, as in the present instance, the expectations raised by the presence of well-known names upon the title page, are more than realized by the contents between the covers.

* "Water Supplies: Their Purification, Filtration, and Sterilization." By Samuel Rideal, D.Sc., and Eric K. Rideal, B.A. (Cantab.), Ph.D. (Bonn). London: Crosby Lockwood and Son; 1914. Price, 7s. 6d. net.

London and Southern District Junior Association.—Next Saturday afternoon the members will visit for a second time the works of the Harrow and Stanmore Gas Company—a previous inspection of which was made by them some eight or nine years ago. A business meeting will be held at the Westminster Technical Institute on Friday, the 22nd inst., when a lecture will be delivered by Professor Vivian B. Lewes, F.I.C., F.C.S.

Fuel Briquetting in the United States.—A paper lately issued by the United States Geological Survey furnishes particulars of the fuel-briquetting industry of the United States in the year 1913. It is stated that the industry is still in a very early stage of development; the briquetted fuel being required merely for domestic use. The number of plants decreased by 2 (leaving 17) in 1913; the quantity of fuel decreased by 17 per cent., and yet increased in value by 5·8 per cent.—the 62,244 short tons produced being valued at $240,643. The materials utilized are anthracite culms or fines, semi-anthracite, bituminous slack, and carbon residue from gas-works making gas from petroleum; the binders used are pitch (from coal tar, water gas, and asphalt), or mixed binders of unpublished compositions. Two plants which utilized coke breeze have remained shut-down for the last two years. The paper gives statistics of the production in the different States, and brief notes on the plants.

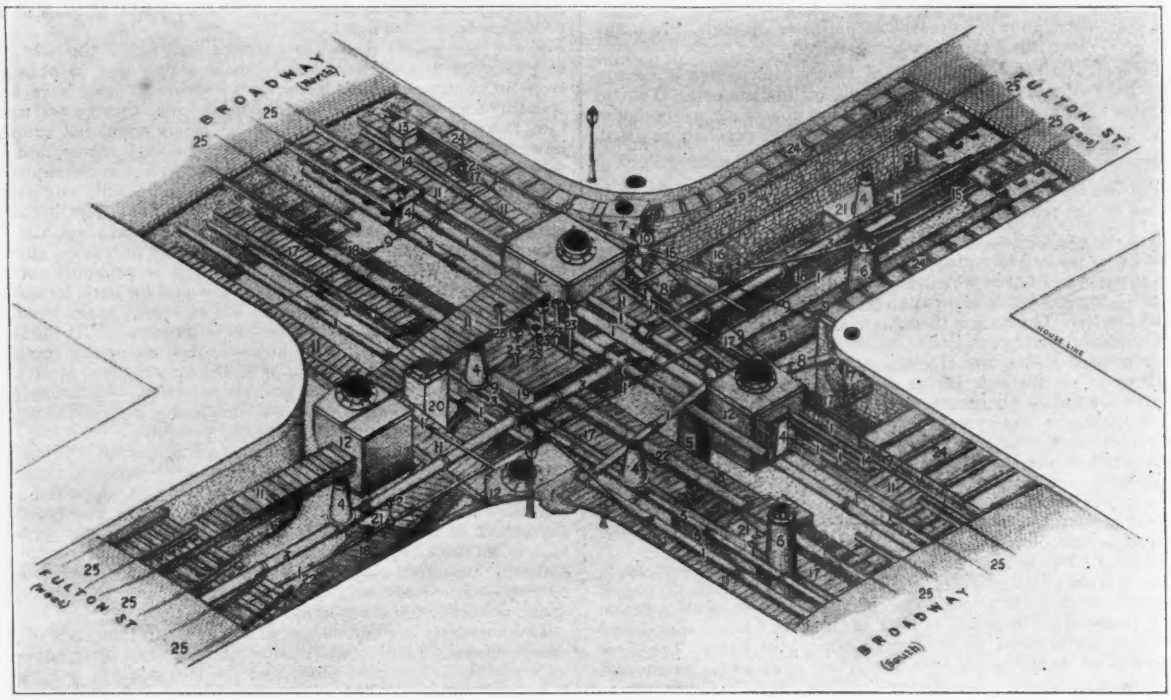
GAS-MAINS IN NEW YORK REARRANGED TO MAKE WAY FOR A NEW SUBWAY.

An interesting "lift" from the American "Engineering News" was made by the "Gas Age" (New York) of the 15th ult., giving an account of unique engineering difficulties presented to the New York Consolidated Gas Company, and how they were solved.

It is explained that, in the extension of the subway lines of the Interborough Rapid Transit Company, in New York City, perhaps one of the most important developments in taking care of the pipes, &c., on the new work was the bye-passing of all the gas-mains and the construction of new pipes for the gas, on the surface of the street and the stoppage of the flow in the pipes underneath before commencing the excavation. This, of course, involved also new temporary house connections as well; but the danger of the accumulation of gas underneath the decking was thereby eliminated. The great danger from this source was demonstrated by explosions at Twenty-Third Street and Fifth Avenue, which, while generally attributed by the Pubic Press to the subway construction, were really caused, if at all, only indirectly by this work. The following description of the method employed in dealing with the gas-mains was recently contributed to "Engineering News" by Mr. C. N. Green.

The present specifications for subway construction call for the street to be planked or decked-over in the business sections or where traffic is heavy, so that business may be carried on as usual and with as little inconvenience to the public as possible. This decking then forms a temporary street surface under which the excavation is carried on. In time dirt and the sweeping of the street make the decking tight, and prevent a circulation of air that would free the excavation of gas if a main should leak.

Cast iron is used for gas and water mains when they are laid underground, for the reason that it lasts much longer under these conditions than wrought iron. It is difficult, however, to keep the lead-caulked joints of such pipe tight even when they are undisturbed; but when they are moved in excavating, and hung-up on the timbering, some joints are sure to be strained and begin to leak.



1. Gas-Mains. 2. Gas Stop-Cocks. 3. Water-Mains. 4. Water Stop-Cocks. 5. Sewer. 6. Sewer Manholes. 7. Receiving Basins. 8. Receiving Basin Connections. 9. Edison Conduits. 10. Edison Manhole. 11. Electric Subways. 12. Electric Subway Vaults. 13. Electric Subway Service-Box. 14. Electric Subway Air-Pipe. 15. Commercial Cable Conduit. 16. Commercial Cable Vault. 17. Pneumatic Tube-Boxes. 18. Steam Company's Conduits. 19. Steam Company's Valve-Vault. 20. Steam Company's Trap-Vault. 21. Steam Company's Expansion-Joint Vaults. 22. Steam Company's Return-Pipes. 23. Steam Company's Valve Stems and Boxes. 24. Cellar Vaults. 25. Horse Rail Roads.

Fig. 1.—ISOMERIC VIEW OF THE UNDERGROUND PIPING AT THE INTERSECTION OF BROADWAY AND FULTON STREET IN 1890.

All mains are, therefore, "killed" where they would be underneath a closely decked street, except in rare cases where small transverse cast-iron mains are replaced under the decking by wrought-iron pipes with screw connections. A temporary system of wrought-iron pipes or bye-passes for gas distribution is laid in the gutters, and connected with the live mains in the transverse streets, and the house and street-lamp services are transferred from the cast-iron mains below the street surface to the temporary system. There is then no live main or pipe containing gas below the street surface.

An 8-inch gas-pipe broken off in the excavation might, under existing conditions, deliver 1000 cubic feet of gas per minute. A 10 per cent. mixture of gas and air will perhaps not always produce a maximum explosive effect; but this is here assumed for

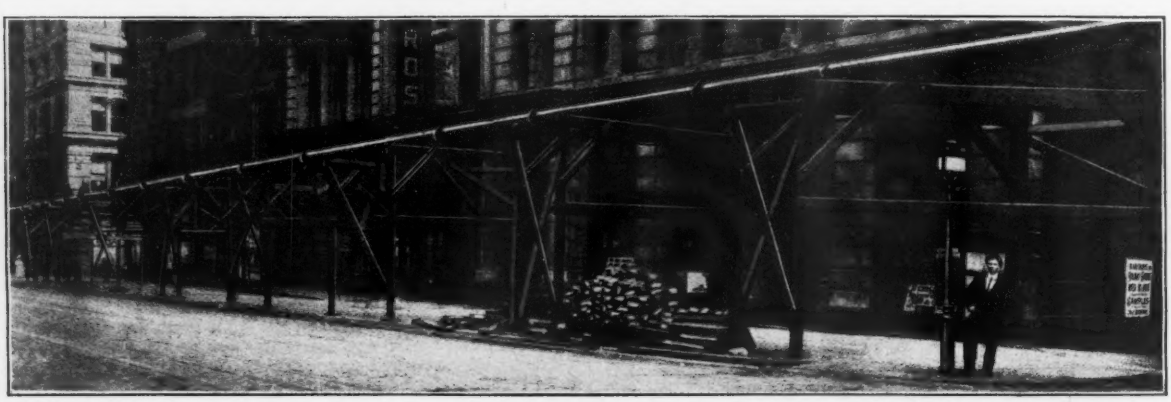


Fig. 2.—AN OVERHEAD GAS-MAIN ON LOWER BROADWAY.

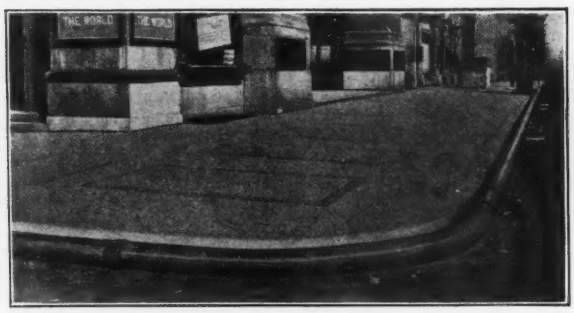


Fig. 3.—A Temporary Gas-Main run next the Street Curb.

convenience, and is near a maximum. This would make 10,000 cubic feet of explosive mixture per minute. A subway cut 25 feet deep, and 60 feet wide, would contain 390,000 cubic feet in a city block; so that theoretically in 39 minutes the block would be filled with an explosive mixture. This, of course, would not be absolutely true, as the gas would not diffuse itself with such rapidity, and the mixture would be higher in gas near the break in the main, and perhaps be too low in gas at the farthest point to explode. If the mixture should explode, however, the gas would burn where there is an excess, and probably set fire to the timber, with results as disastrous as the explosion itself.

Gas mixed with air forms a very explosive compound which only needs a spark to ignite it. This spark might be furnished by the underground trolley of the surface railway, by one of the numerous cables exposed during the excavation, by a lighted match thrown away, by fire-engines, by the shoe of a horse, or by blasting, &c. The violence of such explosions has been frequently shown when manhole heads have been blown into the air, and by numerous sewer explosions which have occurred in the last few years. Philadelphia and Boston had examples in the construction of their subways, and various minor instances have attested to the power of such a mixture.

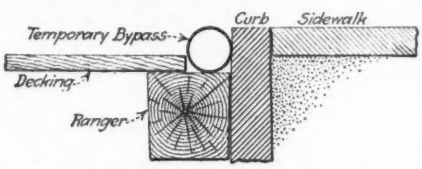


Fig. 4.—Typical Method of Placing a Gas-Main at the Curb.

Knowing the danger from gas, both the Gas Company and the Engineers of the Public Service Commission have taken every precaution to avert it. It was, therefore, decided not to leave any cast-iron mains carrying gas under the decking unless properly ventilated by means of gratings, or protected by watchmen. Where mains crossing the subway excavation could not be cut out of service temporarily, wrought-iron pipe bye-passes were to be built over the street or, in the case of small pipes, carried across under the decking. All connections between the cast-iron mains and the wrought-iron bye-passes were to be carried far enough back into solid earth to avoid the danger of breaking off the pipe if a slide or cave-in should occur.

In mains to be "killed," the flow of gas was first stopped by inserting bags in the pipe, and readings were taken to see if the pressure prescribed by the Public Service Commission could be maintained. The pressures were taken continuously for several days; and if these readings were satisfactory the longitudinal mains were cut off, and capped at intervals of two blocks. In the meantime the bye-pass pipes were laid in the gutter, and connected up. These were 6, 8, 10, or 12 inches in diameter—depending on the requirements of the different districts. Depending on conditions, one or two lengths of pipe were used to carry back in the transverse street; and the turn at the curb was made with a pipe bent to fit the radius of the curb corner—see fig. 3.

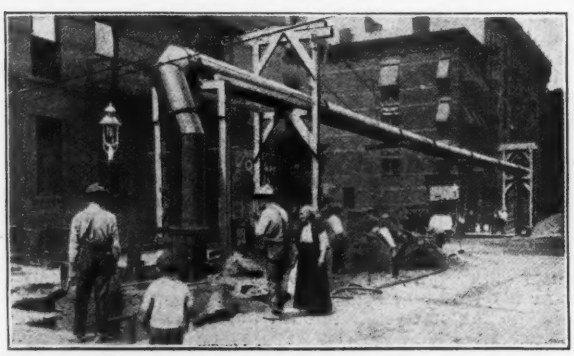
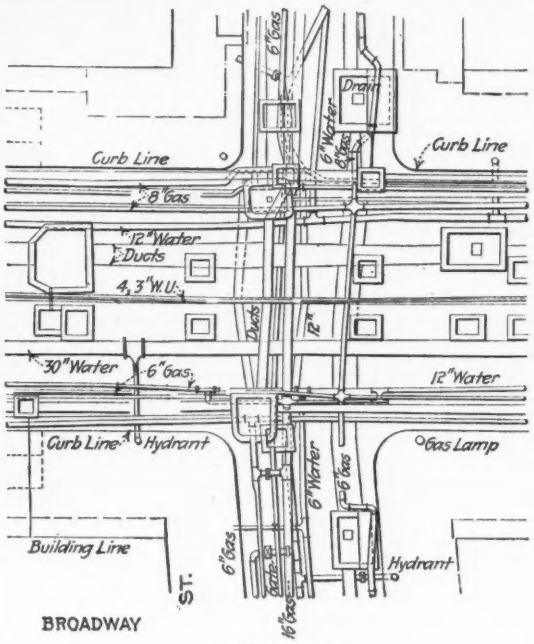


Fig. 5.—An Overhead Gas-Main at Lexington Avenue and 112th Street.

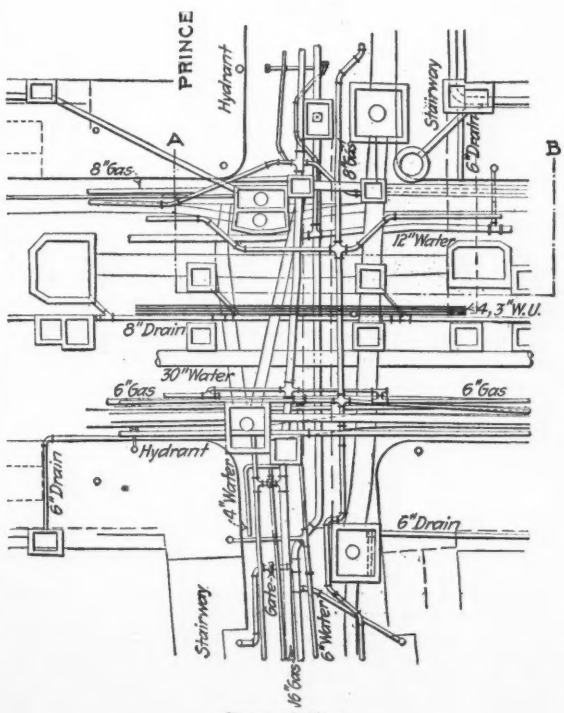
The pipes in each transverse street were then cut and capped some 10 feet back of the sheeting line on both sides of the proposed excavation. Connection was then made with the largest pipe underground on each side of the street and the bye-pass continued underground across the transverse street.

Generally, there are from one to five pipes on each side of the transverse streets. Where there is more than one pipe on the same side of the street, each is connected (back of the caps) with a 1½-inch circulation connection, the vertical legs of which are tapped into the top of the pipe.

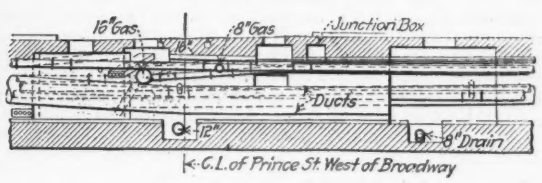
In laying the first bye-pass, little attention was paid to the necessity of keeping the tops of the pipes level with or below the



Existing Plan.



Proposed Plan.



Section on Line A B (Enlarged).

Fig. 6.—A Typical Rearrangement of Underground Piping at a Street Intersection, Old and New Plans of Underpiping at Broadway and Prince Street.

curb. As a consequence, numerous accidents occurred, due to persons slipping or tripping over the pipe. In one instance where the pipe did not lie close to the curb, a boy's leg was broken by being caught between it and the curb. Now all pipes are laid close to the curb, with the top not higher than the curb, even if it is necessary to remove the gutter stones, and the remaining space is filled with concrete.

Extra heavy wrought-iron pipe has been employed generally, so that when the bye-passes are moved, the pipe can be used to relay the cast-iron mains over the subway. The Gas Company have found this desirable, as the vibration from the passing trains loosens the caulking in cast-iron pipes.

In Lower Broadway from Canal Street South are two mains, 16 and 20 inches in diameter respectively, supplying the lower part of the city. These mains were bye-passed during the building of the subway from Vesey Street to Canal Street. Wrought-iron pipes with flanged connections were laid about 14 feet above the sidewalk. The trestle bents were so placed as to avoid entrances, and interfere with business as little as possible. At cross streets, where trestle bents could not be erected, the pipe was trussed with wire rope anchored to the pipe with clamps.

In 138th Street are one 16-inch, one 20-inch, and one 24-inch gas-main forming a cross-town connection between the works and the lower west side of the Bronx. As these were within the sheeting lines, they were "killed," and to take their place two 24-inch riveted steel pipes were laid on trestles, one on each side of the street.

In various locations are large feeder or pumping mains, crossing the line of the subway; and these mains were generally bye-passed overhead—giving about 14 feet clearance for the street cars and other vehicles. A description of one would be typical of all. Fig. 5 shows the bye-pass for the 36-inch main crossing Lexington Avenue at 112th Street. The bye-pass pipe is a 30-inch wrought-iron riveted pipe carried on two gallows-frame supports back of the building-line in the side street. Between these frames the pipe is suspended from two wire ropes carried over the gallows frames, and each anchored back to a deadman. The deadman consisted of an inclined I-beam carried well below the street surface and its lower end embedded in a block of concrete. The main in the street was bagged-off; the pipe cut; and a three-way valve inserted in the line of the pipe. This operation was repeated on the other side of Lexington Avenue. The bye-pass was then connected to the three-ways on either side of the avenue; the bags removed; and the valve closed to throw the gas into the bye-pass and kill the main underground.

The cost of bye-passing service mains, using 6-inch or 8-inch wrought-iron pipe laid in the gutter, varies but little from $50,000 per mile of street bye-passed. The distribution mains requiring 16-inch to 30-inch bye-passes in general run across the island from east to west—thus crossing most of the subway lines nearly at right angles. The cost of carrying a distribution main across the street on trestles may vary from $1000 to $10,000, depending on local conditions. The average cost, however, should be about $2500.

After the construction of the subway and the restoration of the underground pipe, the bye-passes are removed, and the street restored to its original condition.

STATE REGULATION OF PUBLIC UTILITIES IN AMERICA.

"Fixed" v. "Variable" Rate of Return.

We have received from Mr. Henry Lea, a Consulting Gas Engineer, of Chicago, a reprint of an article by him on "The Fixed Rate of Return on Utilities." He contends that the "fixed rate," as adopted by the State Commissions in America, does not meet requirements, and that the variable rate, as suggested by him, will be found not only equitable, but capable of yielding the maximum of benefit to the communities served and to the utilities concerned. It is practically the principle of the sliding-scale that the author advocates, as will be seen from the following extracts from his article.

A uniform wage among men has been shown to result in the over-payment of many men, the under-payment of a smaller number, and the stifling of ambition and effort in many of those most capable of development. I presume it is safe to say that not one of the leaders in any line of effort has been developed except through the hope of attaining a position considered in some way more attractive than that of the average man. The results from the operation of any public utility are largely determined by the attitude of the individuals operating it. If these do not have before them a continuous incentive to greater and more efficient effort, it is obvious that the community must suffer. This incentive is not provided by the type of ruling made up to now by Public Utility Commissions in the matter of the rate of return. This should not be fixed at a given percentage of the rate-making value, but should be variable, and largely determined by the efficiency of the management as viewed from the standpoint of the community served. In other words, if the owners of a given utility, by any proper device, can bring about a reduction in the average selling price of the product, they should be allowed a relatively larger rate of return than is considered proper under the higher selling price.

Let us assume that two given cities have the same population and the same characteristics, in so far as the cost of gas plant construction and of gas manufacture and distribution are concerned, and that they are supplied by separate companies, each selling gas at $1 per 1000 cubic feet, and each having the same volume of sales. If through the coming years the first of these companies continues to sell gas at $1, while the second, owing to more efficient management, succeeds in increasing its sales or in reducing its working expenses, or both, to such an extent as to allow of a reduction in the average selling price, it is obvious that the rate of return allowed to the second company (other things being equal) should be greater than that allowed to the first, because the second, through the reduction in its average price, will have effected for the community a distinct and measurable saving. As between man and man, there should be no question as to the propriety of allowing a higher rate of return in the second instance than in the first.

No community will receive its maximum benefit from the use of gas until the sales are at a maximum; and this will not be obtained until the schedule of rates adopted places gas in a strong competitive position throughout its entire range of possible use. As the maximum earnings of the gas company cannot be reached except through the maximum sales of its product, it is clear that the interests of the community and those of the gas company are very largely identical. It is also clear that such maximum benefits will never be obtained except through the active co-operation of all concerned. It is unfair to demand, and illogical to expect, relatively increased benefits for the community through the use of the product of the utility, without relatively increased reward.

As previously indicated, the rate of increase in reward should be determined by its rate of increase in efficiency as viewed from the standpoint of the community. The author compiled a table showing a specific method of measuring this efficiency. In preparing it, he assumed that a rate-making body examined, in the year 1915, a gas property having, at the beginning of the year, a rate-making value of $10,000,000. He also assumed that during that year the company sold 2000 million cubic feet of gas, and that the average net revenue received from such sales was $1 per 1000 cubic feet, yielding a net total of $2,000,000. He further assumed that for the year the company had operating expense (exclusive of bond interest and dividends) equal to 65 c. per 1000 cubic feet of gas sold, or a total of $1,300,000 for the year. This would leave for bond interest and dividends, 35 c. per 1000 cubic feet sold, or a total of $700,000. He reckoned that with the rate-making value at the beginning of the year there had been added $999,000. The amount of $700,000 available for bond interest and dividends would therefore represent 6·69 per cent. on the average rate-making value of the property throughout the year. It was also assumed that the Public Utility Commission, or other rate-making body, had determined that 6·69 per cent. was a fair average return for the property under the conditions found in the year in question. The author's suggestion is that, instead of maintaining this 6·69 per cent. on the then rate-making value as constituting a fair rate of return through each of the years to follow, the rate allowable to the company should be increased from year to year by an amount not exceeding the saving effected for the community during the year.

In his table, the author assumed that the sales of gas by the company could be increased from 2000 million cubic feet in 1915 to more than 5000 millions in 1925. Accompanying this increase there would, of course, be a very material increase in the property of the company, and consequently in its rate-making value, though this would usually be proportionately less than the increase in sales. It was further assumed that throughout this period the company would find themselves able to make such modifications of their gas-rate schedule as would result in a reduction of 1½ c. per 1000 cubic feet each year in the average selling price of gas, and that they also would be able, in this period and with the sales indicated, to reduce their operating expenses from 65 c. in 1915 to 47 c. in 1925.

Taking the next year (1916), the table shows the gas sales to be 10 per cent. in excess of those for 1915, that the average net revenue per 1000 cubic feet of gas sold for that year is 98½ c., and that the operating expenses have been reduced to an average of 63·2 c. per 1000 cubic feet. Such operating conditions would result in leaving 35·3 c. per 1000 feet sold, or $776,600 available for bond interest and dividends. But this amount represents 6·81 per cent. on the average rate-making value for the year, and is $14,676 more than would be allowed if the 6·69 per cent. rate had been maintained. It therefore becomes necessary to show that the company have actually saved for the community a sum in excess of this $14,676, which the author claims should be allowed in addition to the 6·69 per cent. return on the then rate-making value. During the year an increase in sales of 200 million cubic feet is shown. It is possible that a portion of this might be traced directly to the reduction of 1½ c. in the average selling price of gas; but as the percentage will be difficult, if not impossible, to determine, this portion of the saving to the community is ignored. It is clear, however, that the equivalent of those consumers who used 2000 million cubic feet of gas in 1915 at $1 used the same quantity in 1916 at 1½ c. less. The minimum actual saving to the community through this reduction in price will, therefore have been $30,000. The actual saving to the community in this sum is the measure of the increase in net earnings which the company should be allowed (if able to earn it)

above the 6·69 per cent. determined as a fair rate of return under the conditions of the year 1915. For each of the subsequent years in the table the calculation is carried forward in a similar manner.

Dealing with the advantages of his system, the author says: This method of determining the rate of return, while bringing about important savings to the community, would offer to the company a continuous inducement to increase its sales, the reduction of its operating expenses, and the lowering of the average selling price of gas. To all intents and purposes, it would make the gas consumers preferred shareholders in the gas company. It would also bring about savings to the community constantly increasing not only in the total amount, but also in the percentage that such amount bears to the total paid by the community for gas. For example, the minimum actual saving to them through the reduction in price, in 1916, would represent a saving of 1·38 per cent. of the total amount paid by the community for gas; whereas in 1925 the minimum actual saving would represent 10·84 per cent. of the corresponding total. In the meantime, the net earnings of the company would have increased at a slower rate—viz., from 6·69 per cent. in 1915 to 8·90 per cent. in 1925.

The argument of the existing companies, in hearings before Commissions, has been directed towards securing an increase in the fixed rate of return thought proper by the Commissions. While an increase in the fixed rate of return would doubtless be of some advantage, through providing some further incentive, it still seems clear that a variable rate of return, determined by the efficiency of the utility from the standpoint of the community, will prove of much greater and more certain value than any fixed rate of return. With a variable rate, such as is here suggested, the community would be assured that every effort of those responsible for the conduct of the utility would be bent at all times towards securing greater sales and greater efficiency in operation and a lower average price of its product; for the increase in the volume of sales in connection with the reduction in the average selling price of the product would determine the amount which the company would be allowed to earn in addition to the fixed percentage determined at the time of the original hearing.

SCHOOL LIGHTING BY GAS.

School authorities are becoming more and more alive to the fact that, in justice to the scholars, the simple principle of good artificial illumination must not be neglected. Considerable investigation in regard to the condition of eyesight of school children has resulted in the discovery that short-sight hardly exists among the pupils in the lower grades, but becomes more and more prevalent, till among the pupils who remain in school fourteen years a large percentage are found to have imperfect sight.

A circular issued some time ago by the United States Bureau of Information showed that near-sightedness steadily increases from class to class, until in the highest grades as many as 60 to 70 per cent. of children have defective eyesight. Many similar figures could be given; but these are sufficient to show the importance of the subject. It is true, of course, that all defective eyesight cannot be attributed to poor artificial lighting; but the connection is sufficiently evident to emphasize the necessity of paying great attention to proper illumination.

Some of the important causes of injurious effects due to improper lighting are: (1) Too little light; (2) too much light; (3) glare; (4) undesirable shadows; and (5) streaks. The first two of these causes can be eliminated, of course, by providing uniform illumination of correct intensity. Glare probably causes more injurious effects than any other one evil in school-lighting systems. This is due to the fact that it is a common practice to place light-sources 6 ft. 6 in. to 7 ft. above the floor, and to use reflectors or shades of such shape that the bare light-source is practically within the range of vision. Any attempt to see past these lights (as is necessary in looking at a blackboard) causes considerable eye-strain.

Undesirable shadows usually arise from the use of too few light-sources, or placing the light-sources too near the centre of the room. This arrangement will not give satisfactory illumination on all the desks. Streaks or striations in the illumination are caused by the unreflected light from a lamp or by light reflected from a very smooth or polished surface, such as smooth opal. These streaks cause the eye to try to accommodate itself to two intensities of illumination at the same time—an attempt which cannot fail to be harmful.

Several schemes using "Holophane" reflectors have been installed with satisfaction, notably at Lancing College and Haileybury College; and the accompanying photograph is given as an example of good school lighting. This is the new Big School at Haileybury College, near Hertford, designed by Mr. John W. Simpson and Mr. Maxwell Ayrton, of No. 3, Verulam Buildings, Gray's Inn. The installation consists of a series of 200-candle power ordinary pressure inverted gas-burners, fitted with "Holophane" 16-inch reflector hemisphere units. The burners are placed at a height of 20 feet from the floor, and sixteen of them are employed to light the body of the hall, 100 feet by 50 feet. An additional feed has been run for the bye-passes; and the taps for the burners are attached to the bands of the fittings. The results obtained, as will be seen from the photograph (which was taken entirely by artificial light), are most satisfactory; the illumination being uniformly distributed upon the students' desks. The light is well diffused; and the sources of light are entirely out of the range of vision.

A NEW "HULO" BURNER.

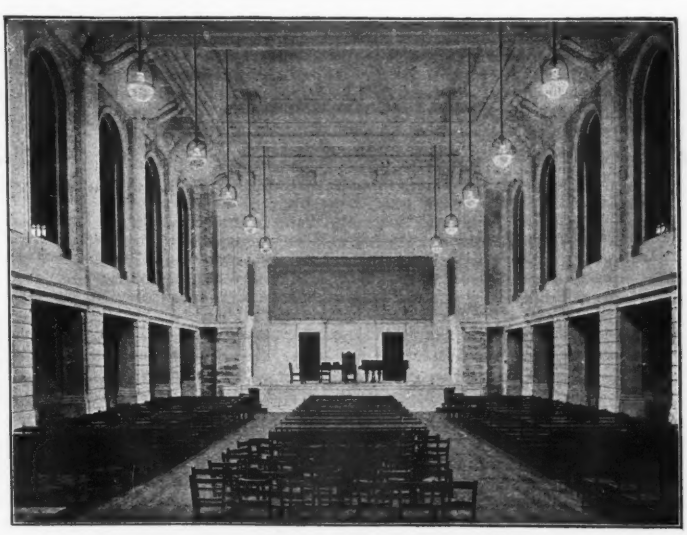
That a large measure of popularity has already been secured by the standard sized "Hulo" inverted burner is evident both from the number of orders which have been received and from the testimony of users. During the present season, great confidence is felt by Messrs. D. Hulett and Co., Limited, of Nos. 55 and 56, High Holborn, W.C., whose burner it is, that this popularity will be considerably enhanced, through improvements which are being introduced.

What the firm have done has been to secure the maximum amount of reflecting surface on the inner portion of the burner; and they claim that the result is, as might be expected, an improvement in the lighting power. Over the portion of the brass burner tube between the nozzle and the deflector is fitted a white porcelain tube; and as the deflector itself is of similar material, the whole of the inside of the burner constitutes a light-reflecting surface. In addition to this, the wide upturned edge of the white deflector runs completely round the burner; the supports for the brass globe gallery being carried through the porcelain, instead of, as is usually the case, deflecting wings being passed through openings in the metal burner-top. The porcelain tube is easily removable; and altogether the burner is very easily cleaned, and has a nice, neat appearance. It is solidly made, as all British things should be; and a point to be borne in mind is that, in spite of the improvement referred to, and an alteration in the insulated air-regulator, it has not been found necessary to make any addition to the price of the burner. The firm stock an excellent range of lanterns (in oxydized copper finish, and fitted with white muffled glass panes) suitable for attaching to all inverted burners; and the suggestion may be made that the new "Hulo" burner with one of these lanterns would form a really excellent hall light.

Improved Reflecting Burner.

In the course of conversation with a representative of Messrs. Hulett and Co., it was gathered that, in spite of the disturbed conditions in the mantle industry, they have not experienced any difficulty whatever in supplying their well-known registered brands of "D.H.," "Hulo," and "Unic" British-made mantles.

An opinion has been promulgated of the Pennsylvania Public Service Commission that it is unlawful discrimination for any natural gas, artificial gas, electric light, water, or other public utility company to grant a discount on a bill to any customer after the regular discount period has expired. In order to obtain the published discounts, customers under the requirements of the law must mail their cheques so that they will be received by the gas, water, or light companies on or before the last day of the discount period.

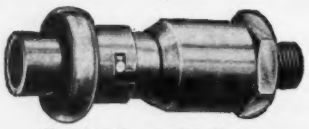


An Example of Gas Lighting with "Holophane" Reflectors.

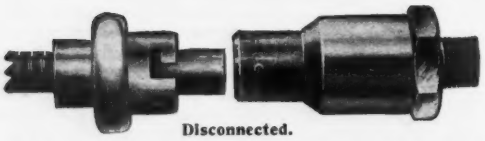
THE "BASECO" GAS-PLUG.

With the increasing number of uses to which gas is put in the household, it is only reasonable to anticipate a growing demand for interchangeable connections. That such a need has been recognized by inventors, the "Journal" pages have already shown; and now attention is drawn to the "Baseco" gas-plug, which has been devised with the object of obtaining by as simple means as possible a quick supply of gas in any required position. This, of course, enables consumers, with only one or two permanent gas supply points in a room, to utilize at will lights, fires, irons, boiling-rings, grillers, or any of the other efficient and labour-saving devices which gas places within their reach; and it also permits the lighting fittings to be removed and replaced when desired.

The patentees and makers of the "Baseco" gas-plug are the "B.S." Engineering Company, of No. 4, Lloyd's Avenue, E.C., who point out that there are no complicated parts through which trouble could arise; while another thing urged in favour of this British-made article is its very moderate price. The female part of the interchangeable union valve can be instantly detached by



Showing Connection Made.



Disconnected.

a one-eighth turn from the fixed male part, and plugged to any other position where a male part is fixed. As the seat or valve is in the male part, the arrangement is interchangeable without any possibility of leakage. The act of giving the necessary one-eighth turn to detach the female part, closes the valve in the male part; so that no chance arises of leaving the gas turned on after it has been disconnected.

The plug is stocked in several sizes, and can be supplied in any finish.

GAS COKE AS FUEL FOR MOTOR OMNIBUSES.

Successful Adoption by the National Steam-Car Company.

In another part of the "Journal" will be found some remarks by the Chairman and Managing-Director of the National Steam-Car Company (Mr. T. Clarkson), at the meeting last Tuesday, on the subject of the trials which had been made of coke as fuel for driving their omnibuses. Reference to the matter has already been made in our columns. The trials were carried out by the Chief Commissioner of Police; and the Royal Automobile Club regarded them as the most meritorious performance of the year. They testified their appreciation by awarding the Company the Dewar Trophy.

The following is the Club's certificate, which furnishes particulars of a run from London to Brighton and back, *via* Redhill, Crawley, and Heckstead.

The engine was a two-cylinder compound, with cylinders 3½ in. and 4¾ in. by 4 in., supplied with steam from a water-tube boiler fired with coke fed automatically. The gear ratio was 7·4 : 1, and the diameter of the road wheels was 1050 mm. (3 ft. 5 in.). The weight of the lorry was 3 tons 16 cwt. 1 qr. 15 lbs. The fuel was broken coke, passing through a 2 inch mesh, and held by 1-inch mesh, and was found on examination to be commercial coke of fair quality. The following tests were made: Calorific value, 12,468 B.Th.U.; moisture, 1·45 per cent.; ash, 11·04 per cent.

The following are the details of the second day's tests, which are in some respects slightly more favourable than those of the first day: Gross weight, 14,728 lbs.; net load, 6173 lbs.; distance run, 109½ miles; average speed (running time only) kept below 12 m.p h., 12 m.p.h. Coke used, 403 lbs.; per mile, 3·68 lbs.; per ton-mile (gross), 0·560 lb.; per ton-mile calculated on load carried, 1·335 lbs. Time taken to raise steam from cold (250 lbs. per square inch), 21½ min.; number of coke replenishments each day, one; do. water, one. Gallons of water used, 70⅘; miles per gallon of water, 1·5; miles run before water replenishment, 54¾. Atmospheric temperature, 72° Fahr. Dry weather and roads good.

It may be pointed out that the fuel costs of a coke-fired motor are less than ½d. per mile with a 3-ton load, compared with ¾d. per mile for a similar type of steam-motor using Welsh coal. A coke-burning grate may be fitted to any type of steam-motor, and it has simply ⅜-inch air-spaces between the fire-bars, instead of the usual 7/16-inch spaces provided for the more friable Welsh coal. Makers usually guarantee the maximum capacity of their waggons with gas coke as fuel. This is a very promising market for coke, and it should be recognized by the gas industry.

EFFECT OF PRESSURE ON THE COMBUSTION OF EXPLOSIVE MIXTURES OF GAS AND AIR.

[An Abstract Translation of a Communication to the "Journal für Gasbeleuchtung," by Herren E. Terres and F. Plenz.]

(*Concluded from Vol. CXXVIII. p.* 731.)

Summary of Results.

The difference in the behaviour of the three gases which have been investigated can now be clearly distinguished. The annexed diagram, fig. 8, expresses graphically the whole of the experimental

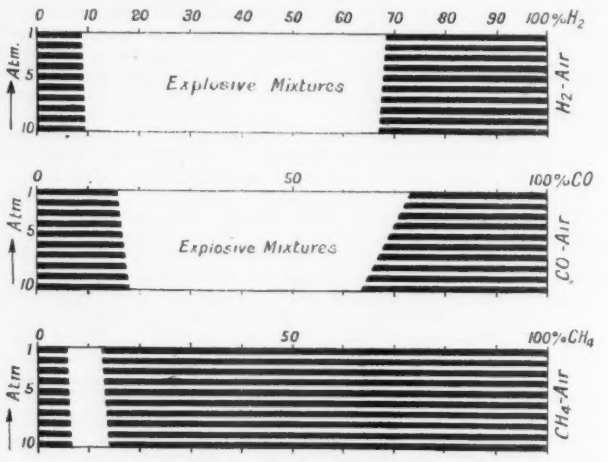


Fig. 8.—Effect of Pressure on the Explosive Limits.

results obtained. It will be seen from it in the first place that the compass of the explosive mixtures is very different for the different gases. Hydrogen and carbonic oxide are the gases which have the widest range of explosive mixtures. At atmospheric pressure 60 per cent. of all mixtures of hydrogen (with air) are explosive, and 57 per cent. of all similar mixtures of carbonic oxide; but only about 7 per cent. of such mixtures of methane are explosive. This difference may be explained by the fact that methane requires four times as much air for its complete combustion as is required by either hydrogen or carbonic oxide. The diagram also shows how the explosive limits shift as the initial pressure is increased. They shift to a relatively small extent with hydrogen and methane—an increase to 10 atmospheres with hydrogen raises the lower limit by 0·5 per cent. and lowers the upper limit by 1·5 per cent. (thus reducing the explosive range), and with methane it raises the lower limit by 0·5 per cent. but raises the upper limit by 1·5 per cent., probably owing to the reactions which accompany its combustion. Pressure has a much greater effect with carbonic oxide—an increase from 1 to 10 atmospheres raises the lower limit by over 2 per cent. and lowers the upper limit by nearly 10 per cent. It may thence be inferred that at a certain initial pressure the theoretically perfect mixture of carbonic oxide and air could not be completely burnt. By extrapolation from the curves already given it would appear that only 70 per cent. of combustion would take place with the theoretically perfect or correct mixture if the initial pressure were 53 or 60 atmospheres, according as the upper or the lower limit curve is followed. This is on the assumption that the curve continues without deviation, which is rather improbable.

The following is a comparison of the explosive limits at 1 atmosphere pressure, deduced from these investigations for the experimental conditions adopted in them, with the explosive limits found by Eitner, when using a tube 19 mm. in diameter.

—		Terres and Plenz.	Eitner.
		Per Cent.	Per Cent.
Hydrogen	lower limit	8·9	9·4
,,	upper ,,	68·8	66·4
Carbonic oxide	lower ,,	15·8	16·5
,, ,,	upper ,,	73 5	75·0
Methane	lower ,,	5·9	6 1
,,	upper ,,	12 9	12·8

Eitner's experiments on the effect of initial pressure showed that while hydrogen was but little affected, the range of explosive mixtures of carbonic oxide was considerably extended by increase of pressure. The latter observation is directly opposed to the author's results, which show that the range is reduced instead of extended. This may be due to the authors having drawn their conclusions solely from analyses of the products of the reactions, whereas Eitner chiefly pursued the optical method of observation. The intensity of the light produced is much greater with carbonic oxide and methane than with hydrogen. Eitner's pressure results, however, are in closer agreement with earlier observations. The law of mass reactions would clearly favour

acceleration of the reaction by an increased concentration or pressure; and since almost all combustion phenomena are attended by diminution of volume, they should on this account also be favourably influenced by pressure. It is necessary, in order to find an explanation of the apparently anomalous behaviour observed by the authors, to revert to the theoretical considerations by which the phenomena which attend combustion are explained.

These considerations have been clearly set forth by van't Hoff. According to him, if a medium which will not enter into the reaction is raised to a certain temperature and the source of heat removed, an equilibrium with the environment is established, and the temperature of the medium falls continuously to that of its environment. The course of this cooling is shown by the curve A^1_1, in fig. 9, in which the abscissæ represent time and the ordinates temperature. But if the system is one in which reaction can occur when the higher temperature is reached, three other distinct cases may be distinguished—viz.: (1) When the temperature attained is so low that the heat liberated by the reaction does not suffice to cover the losses of heat, and consequently the temperature falls, but to a smaller extent than in the

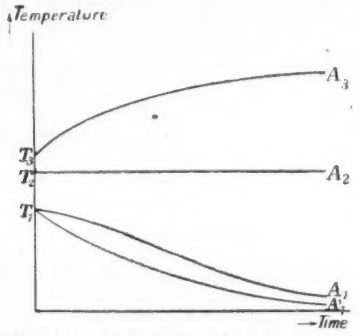


Fig. 9.—Development and Exchange of Heat [van't Hoff].

preceding case, because during cooling there is some, though gradually less, development of heat. This case is represented by the curve A_1. (2) When the initial temperature is sufficiently high, the heat developed in unit time may exactly cover the losses of heat—the reaction then proceeds unaided, and is isothermous, and the system maintains its ignition temperature, as in the curve A_2. (3) When the heat developed exceeds that which is lost through conduction and radiation, the system becomes further heated, and the velocity of the reaction is accelerated. This case is represented by the curve A_3.

These definitions of van't Hoff implicitly include the explosive limits of gaseous mixtures. The latter may be defined as the degrees of concentration of combustible gas at which the heat developed in unit time exactly covers the loss of heat, so that combustion just spreads or ceases to spread through the mixture. Regarding the matter in this light, it follows that the losses of heat by conduction and radiation increase as the pressure is increased. The kinetic theory of gases teaches that heat conductivity and internal friction are independent of pressure; but other phenomena also come into consideration, owing to the state of motion prevailing in the gaseous system. Thus the heat conductivity of the gas participates in conducting away heat at the higher pressure to a far less extent than convection.

In the foregoing researches on the effect of pressure on the combustion of explosive mixtures of gas and air special importance was attached to the precise determination of the products of the reaction. Rise of initial pressure was found to narrow the compass of explosive mixtures, especially with carbonic oxide. The upper explosive limit with methane was found to be an exceptional case. The occurrence of partial combustion prevents the explosive limits being exactly defined, except in the cases of the upper limit with hydrogen and methane where partial combustion does not occur.

Price of Coke at Newbury.—Referring, at a meeting of the Town Council, to the demand for coke in Newbury, Alderman Elliott said it seemed to him strange that large quantities should be purchased from Birmingham, when their own yard was over-stocked. He suggested that the Gas Committee should reduce the price. The Chairman of the Committee (Alderman Lucas) pointed out that the big stock on hand at the gas-works was due to the loss of a large customer, owing to some lime works having closed down; but he added that the stock of coke was being reduced.

Brentford Gas Company's Charge for Fittings.—The Hayes Urban District Council have had before them a letter from a ratepayer complaining of the Brentford Gas Company having issued a circular stating that 2d. extra would be charged in respect to fittings, making the charge 10d. per 1000 cubic feet. People who had had gas laid on for some years, the writer pointed out, had practically paid for their fittings, and were therefore entitled to consideration. Mr. Brown said the increased charge for fittings appeared to have been brought about to avoid an increase in the price of gas. He thought, however, they should ask for an explanation from the Brentford Gas Company. The Chairman (Mr. B. E. Liddall, J.P.) added that the new arrangement hit the poorer people; for those in better circumstances could afford to buy their own fittings. Mr. Drenon seconded the resolution that the Company be asked for an explanation, and it was agreed to.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Income-Tax on Allowances to Dependants.

SIR,—A matter worth the attention of accountants and secretaries of gas undertakings, whereby a concession on income-tax assessments may possibly be obtained, was communicated at a meeting of the Birmingham Chamber of Commerce held in the early part of last week. It appears that the General Purposes Committee of the Birmingham Chamber had recently made inquiry of the Treasury on the question of the payment of income-tax on the total amount paid by an employer as allowances to the dependants of employees who have joined the Colours, or in respect of salaries (partial or whole) paid to employees absent for the same reason.

The Committee has been informed that no objection will be raised if the Local Commissioners, in computing an employer's liability to income-tax, are prepared to allow as a deduction the actual sums so expended.

Voluntary allowances, gratuities, &c., are not in the ordinary course legal deductions from the incomes of the donors; and one assumes that surveyors, before finally agreeing on the next assessments, will ask to be furnished with the total amount of such allowances, with a view to adding the same back for assessment. Armed with the above assurance, however, it should not be a difficult matter to persuade Local Commissioners to allow these voluntary payments to stand as a trade expense.

To disallow as such would be penalizing a form of patriotism in which gas undertakings have taken a fine lead. To concede the point would be just and gracious.

With the present high rate of income-tax, and a possibly extended war, the allowance would prove appreciable.

One feels therefore that, as regards gas undertakings, the matter merits the wide publicity your columns can afford it.

F. A. GULLAND, Secretary,
Maidstone Gas Company.

Maidstone, Dec. 30, 1914.

Current Sales of Gas Products.

SIR,—Adverting to "Lancashire Tar Distiller's" note, p. 627 of your issue of Dec. 15, and "Midland Tar Distiller's" reply, p. 676 of your issue of Dec. 22, one can hardly believe that any tar distiller in this country would be so foolish as to force the sale of pitch at the present time.

It is within my own knowledge that the Yorkshire tar distillers and the producers in the district came to an amicable understanding on this question shortly after the outbreak of the war. Under the arrangement made, pitch is not to be sold at less than 34s. per ton without the consent of the tar producer; and meantime a sum approximately equal to the value of the liquid products is being paid to account of each ton of raw tar delivered. This, in my opinion, is a wise and business-like arrangement, and reflects credit on the Yorkshire district.

Every district in the country, however, is not so happily situated; and it is rumoured that an effort will be made to get the prices at which pitch and tar have changed hands since the commencement of the war published in the "JOURNAL." But no practical purpose can be served by such a proceeding. The figures so published could not in any sense be associated with the standard "JOURNAL" quotations, which in many cases form the basis of prices to be paid from time to time under contract.

ONE WHO IS IN THE THICK OF THE TROUBLE.

Dec. 31, 1914.

Testing Furnace Temperatures.

SIR,—As to the results of the tests of a Manchester furnace, published on p. 300 of the "JOURNAL" for Nov. 10, by a slight error, corrections are suggested for the temperatures in these experiments; and, in order that other observers may not fall into the same error, we are writing to you on the subject. In doing so, we must at once disclaim any idea of unkind criticism; for we know from our own experience how very easy it is to make slips of this kind.

In discussing the corrections to be applied both to the thermocouple and the Féry pyrometer, in these experiments, it must be understood that we have no data as to the actual instruments that were used, and therefore any criticisms now made can only be offered from the general point of view.

The correct way to allow for the cold-junction error of a thermocouple is to set the indicator pointer to the cold-junction temperature—namely, 17° C. (= 62° Fahr., as we assume 62° C. is a misprint, as this is stated to be the normal atmospheric temperature). It would then have been seen that the readings were increased by 11° C. at 1100° C. (and not by 17° C., owing to the fact that a platinum-iridium couple gives more volts per 1° C. at 1100° C. than at 0° C.). This correction is easily calculated, but is at once automatically allowed for by the above procedure of setting the zero.

The real object of this letter is to point out that it is not necessary to add corrections for the cold-junction temperatures to readings obtained with a Féry pyrometer. The cold junction of the small thermocouple in the interior of a Féry pyrometer is close to the hot junction on which the radiation from the muffle is received. The difference in temperature between the two junctions gives the E.M.F., which is interpreted in terms of the furnace temperature on the galvanometer scale. Within any range of temperature occurring in practice, the effect of heating the pyrometer itself makes no difference in the readings obtained on the galvanometer; the reason being that the two junctions are heated through the same amount simultaneously, and that therefore no observable difference is made in the resultant electromotive force. In the case, therefore, of the experiments under discussion, no correction should be applied to the readings given on the Féry pyrometer. The actual temperatures are correctly given in the

table. Assuming that the thermocouple reading was 1100° C., *plus* a correction of 11° C.—viz., 1111° C.—there is a difference between the two instruments at 11.17 a.m. of 96° C.

This result is probably quite accurate, as the thermocouple itself is in the hottest part of the furnace, while the Féry instrument is focussed on the cooler end wall of the muffle. If the latter instrument had been focussed on the end of the couple or the roof of the furnace, a check between the two instruments could have been obtained.

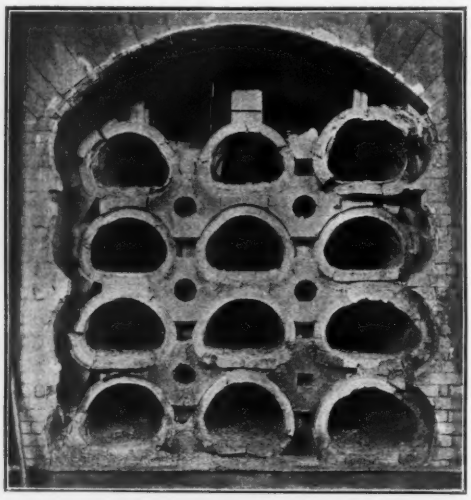
We must once again emphasize the fact that, in writing this letter, we are not wishing to unkindly criticize; it is only to prevent future observers from falling into the same error.

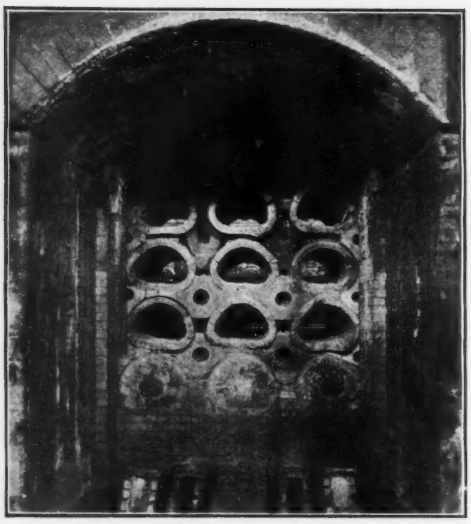
For the CAMBRIDGE SCIENTIFIC INSTRUMENT COMPANY, LIMITED,
ROBERT S. WHIPPLE, Joint Managing Director.

Cambridge, Dec. 29, 1914.

Life of British Fire-Clay Retorts.

SIR,—We observed in the "JOURNAL" for Dec. 22 that there was a photographic testimonial to British fire-clay retorts, which has been very interesting to us. While these retorts are stated as British, we regret it does not say who the manufacturers are. We also note that the full working life of these retorts is given as 2104 and 1755 days respectively.





Front and Back Views of a Retort-Bench at the Provan Gas-Works, Glasgow (built entirely of Glenboig Retorts and Bricks), after a Working Life of 2380 Days.

We ourselves had a photograph taken of a bench of our own retorts in the Glasgow Corporation Gas-Works at Provan, and are sending two views of same, showing the front and the back of the bench. These photographs were taken after the bench (which was entirely built of "Glenboig" retorts and bricks) had been working for no less than 2380 days. This you will note is better than those referred to in your issue a fortnight since.

For the GLENBOIG UNION FIRE-CLAY COMPANY, LIMITED.
RICHARD BAXTER, Secretary.

Glasgow, Dec. 30, 1914.

Weardale and Consett Water Supply.—A reservoir capable of holding 800 million gallons of water is to be built by the Weardale and Consett Water Company in Upper Weardale, within three miles of Weardale, at a cost of £650,000. To this reservoir are to be attached pipes which will be laid for some 27 miles, touch the Company's two large reservoirs at Walsingham and Waskerley, and terminate at Wheatley Hill in the eastern part of the county of Durham.

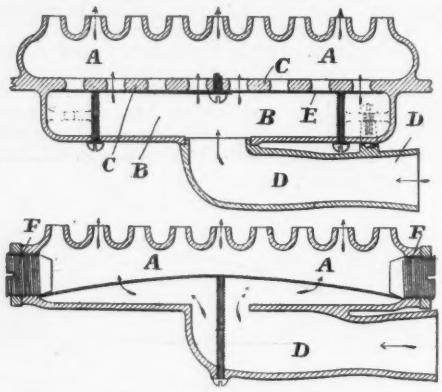
REGISTER OF PATENTS.

Burners for Gas-Fires.

GRAFTON, A., of Southampton.

No. 1557; Jan. 20, 1914.

This invention, relating to burners for gas-fires, consists of a means of holding and positioning the interior perforated plate or plates "so that back-firing is prevented, noise eliminated, and a better mixture of the gas and air in the burner secured."



Grafton's Gas-Fire Burners.

In the first form shown a horizontal tube-like chamber is divided along its length into an upper or nozzle chamber A and lower or secondary mixing chamber B by a horizontal web or partition C, in which are holes. The top chamber carries the burner nozzles; the bottom chamber being connected to the gas inlet, or injector, or primary mixing chamber D. Two strips of perforated metal or gauze E are inserted in opposite directions in the lower chamber, so arranged as to cover the whole of the bottom of the partition C. The strips of gauze are secured in the middle of the burner by a screw which clamps the two centres of the gauze to the partition C.

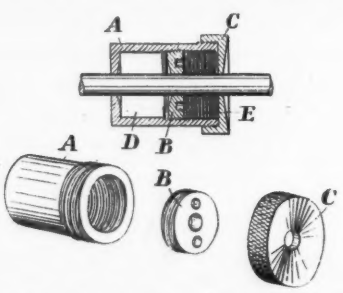
In the case of twin chamber burners (as shown in the second instance), there is only a primary mixing chamber D and a nozzle chamber A. The ends of the latter are formed with screw-threaded holes, in which conical-ended screw-plugs F secure a strip of perforated metal gauze in the nozzle-chamber. In the bottom of the primary mixing-chamber is tapped a hole through which is passed a screw, projecting into the nozzle-chamber, of sufficient length to press against about the middle of the perforated metal strip and curve it upwards in the middle.

Stuffing-Box for Gas-Meters.

GEORGE GLOVER AND CO., LIMITED, and PERRY, J. J., of King's Road, Chelsea.

No. 15,179; June 24, 1914.

This invention (relating to the stuffing-boxes for the index-actuating shafts of gas-meters) has for its object "to provide a construction that will ensure effective gas tightness for long periods." The stuffing-box is divided into two chambers by an internal adjustable screw-threaded disc. The inner chamber contains the usual packing of (say) oiled wool, which is tightened up to any desired degree by the adjustable disc, while the outer chamber contains a suitable lubricant—*e.g.*, lubricating fat—which is not compressed but is simply retained in place by a screw-cap closing the end of the stuffing-box. The lubricant is thus retained in an enclosed chamber instead of in a separate grease cup, from which it is liable to be displaced during transport. Alternatively, the two chambers may be used for two different kinds of packing.



Perry's (George Glover and Co.) Gas-Meter Stuffing-Box.

A central longitudinal section of the stuffing-box is given; also a perspective view of it showing the barrel, the inner screw-threaded disc, and the cap, separated from one another.

The barrel A of the stuffing-box, secured to the partition of the meter, is screw-threaded internally; and within the barrel is placed a disc B, which is screw-threaded on its periphery to engage with the screw-threaded interior of the stuffing-box. This disc is furnished with recesses to provide means whereby it can be rotated to screw it in and out. The external periphery of the barrel near to its open end is also

screw-threaded to receive a screw-cap C, which closes the end of the barrel. The inner chamber D is packed with oiled wool, which is compressed by the disc B; and the outer chamber E is filled with lubricating fat, retained in place by the cap C. The requisite pressure can thus be secured on the packing without squeezing out the lubricant.

Since the cap screws on the exterior of the barrel instead of engaging with the interior of it, more room is obtained in the stuffing-box without taking up more space in the meter.

Gas Supply Arrangement for Kitchen Stoves.

TOUSSAINT, A. J., of Paris.

No. 12,917; May 26, 1914. Convention date, May 28, 1913.

It is well known, the patentee remarks, that when a gas-stove is used, the main tap is opened and then the tap of the branch pipe corresponding to the burner to be used. To extinguish this burner when it is necessary, the tap on the branch pipe is turned off; but the user of the stove neglects, or frequently forgets, to turn off the main tap—"a circumstance which is daily the cause of asphyxiations or explosions." He therefore proposes an arrangement, which may be fixed to all existing gas-stoves, to avoid such troubles if the user of the stove forgets to turn off (1) the stove-tap, (2) the meter-tap.

The arrangement suggested according to this invention is fitted in substitution for the existing stove-taps, and comprises taps which are arranged upon a distributor screwed to the main pipe and adapted to receive flexible tubes leading to a bundle of distributing pipes placed in front of the stove and from which branch off the pipes leading the gas to the burners. "Having no main-tap between the main pipe and the burners, the user of the stove is therefore compelled to extinguish a burner by turning off its corresponding tap on the distributor, so that the main pipe is shut off at the same time."

Retort Charging and Discharging Apparatus.

BANCROFT, F. J., and HANSFORD, J. B., of Barnet.

No. 13,218; May 29, 1914.

This invention has for its object "to provide a charging and discharging apparatus whereby the retort can be filled substantially completely in one, two, or more shots or operations, and the coke or other residue, after the distillation is completed, can be pushed out at the farther or discharge end of the retort."

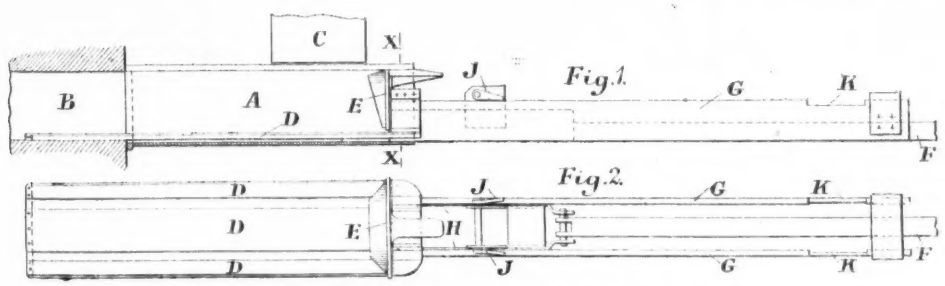
retort, so as to fit closely thereto. The plate during the charging operation is pushed along the floor of the trough in any suitable manner; coal from the shoot C falling on it up to approximately the level of the top of the trough A till the end of the plate D comes under the shoot when the shoot door is shut, and the head E is moved forward behind the charge into the retort. When the plate D with the charge has been inserted the desired distance into the retort, it is withdrawn and, its head remaining stationary while the plate itself is withdrawn under it, the fuel is pushed off on to the floor of the retort, "practically filling it up to the top."

The plate D may, it is said, be replaced by an open grid or the like according to the character of the fuel. It may be rigid (as shown) or jointed or hinged, so that, on withdrawal from the retort, it may be folded up or led in a direction other than horizontal.

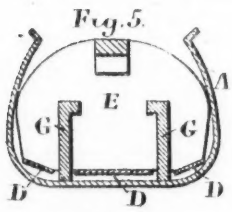
To push the plate or grid into the retort a heavy butt-link chain F (shown diagrammatically in the engravings) may, in known manner, be used.

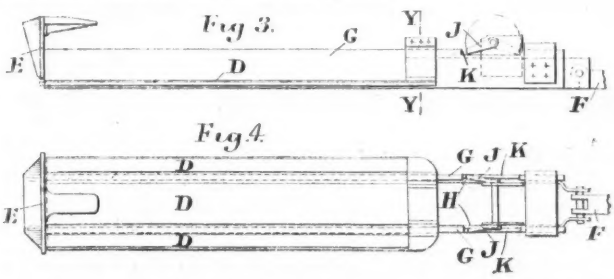
In the arrangement shown, the charging bed consists of three plates D—a wide central one, and two narrow side ones—with spaces between them. These plates are joined together at their front end by a bar and at their back ends by a double-bridge arrangement of plates (fig. 6) forming a guide for the rails G, which are attached to the head E. These rails are made of comparatively heavy section, so that they will normally remain in any position in which they are placed under their own weight. At their front ends they are connected to the head plate E, and at their back ends (beyond the double bridge-plates) they are connected by a bridge-plate. The spaces between the charging plates D are of such width and so spaced that the plates can move longitudinally between and outside the rails G; the double bridge and the plates themselves being guided by the rails. When the plates D are being pushed forward, they move independently of the rails and head till the bridges butt against the back of the head, when this is moved also forward together with the rails. Again, when the plates are withdrawn, they slide between and outside the stationary rails till the cross bar engages the front of the rails or the head, when the plates, the head, and the rails all move backwards together. The rails are preferably formed with a flange, underneath which slide the side plates H fixed to the bridge, and to which the chain F is attached. This prevents the end of the plates D from lifting.

The plates H carry brackets, upon which are pivoted catches J. The rails are also provided with recesses K, so that, when it is desired to push forward the plates D and head E in the position shown in figs. 3 and 4, it is only necessary to turn the catches to the position shown, when they will move forward together. In this position the head E may be employed for discharging a retort; the head being pushed into



Bancroft and Hansford's Retort Charging and Discharging Apparatus.





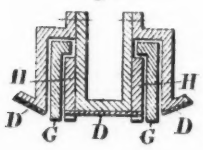


Fig. 1 is a side view of one arrangement of the apparatus commencing to insert a charge into a retort; fig. 2 is a plan of same; fig. 3 is a side view, showing the apparatus fully withdrawn from the retort, and the parts in position to discharge the retort; fig. 4 is a plan of same; fig. 5 is an enlarged section on the line X of fig. 1; and fig. 6 a section on the line Y of fig. 3.

Mounted on a carriage or trolley and made so as to be adjustable with the charging and discharging apparatus is a trough A, of a shape approximately the same as that of the mouth of the retort B to be charged. The trough is also preferably made adjustable longitudinally, so that it may be moved right up against the mouth of the retort when it is to be charged. Over the trough is arranged a shoot C, connected with a fuel bin or hopper carried by the carriage or trolley, with an automatically operated door at the bottom to cut off the coal at the right times.

Adapted to be moved longitudinally in the bottom of the trough and the retort is a plate D, in shape more or less as the bottom of the retort behind the coke, which is discharged at the other end. The catches may (as shown in dotted lines) be also employed for drawing back the head E and rails G.

The charger plates may, according to circumstances, be equal to the whole length of the retort, in which case one charge fills the retort, or they may be made of any shorter length, in which case the retort is charged in two or more shots. When a suitable indicator is employed, this can be done without jamming the charge in any way—"a point which it is necessary to observe in gas-retort charging." When the coal is one which expands in the retort on heating, the plates D may be "suitably raised" above the floor of the retort, to compensate in charging for any such expansion.

The discharging head E is preferably fitted with a hood or curved flange around its upper edge, to prevent the coal or coke rising over the plate under the pressure or thrust to which it may be subjected. Further, there may extend rearwardly from the highest point of the discharging head (so as to be contiguous with the roof of the retort), an arm adapted to prevent the head tilting or rising off the floor of the retort as it is moved in or out.

Messrs. Alder and Mackay, of Edinburgh, have forwarded a consignment of pipes made by Messrs. John Cotton and Son for distribution among the men of the service battalion of the Fourteenth County of London ("London Scottish").

MISCELLANEOUS NEWS.

BELFAST CORPORATION GAS UNDERTAKING.

A Record of Progress.

An article in a recent issue of the "Belfast News Letter" furnished some particulars of the progress of the gas undertaking of the Corporation, and bore testimony to the ability displayed by the Engineer and Manager (Mr. J. D. Smith) and his staff in carrying on with economy the various processes of gas manufacture. The following are some extracts from the article.

The growth of the gas-works, as well as the development of the city during the last forty years, is shown by the fact that whereas in 1874—the year in which the gas undertaking passed into the possession of the Corporation—the output of gas was only 416 million cubic feet, in 1913 it reached 2528 millions—the latter figure being a large increase on that of 1912, which was recorded at 2338 millions. Since the Corporation began to supply gas, the aggregate net profits have amounted to £1,357,109, out of which no less a sum than £350,262 has gone to the relief of rates and kindred objects. The maximum producing capacity of the plant is 14,640,000 cubic feet per 24 hours; and when the scheme which has been approved of by the Corporation has been completed, the plant will be equal to a production of 22½ million cubic feet per day. The scheme is being carried out in four sections, the first of which was completed two years ago.

From the 1st of October last the price was reduced from 2s. 3d. to 2s. 1d. per 1000 cubic feet, with a discount of 20 per cent. on accounts paid within a month. The past financial year, which ended on the 31st of March last, was remarkable for the very high prices which had to be paid for coal and oil; the cost being even greater than in 1901, when the profits dropped to £22,968. Since that date, according to an interesting statement made by the Chairman of the Gas Committee (Alderman James Craig, J.P.), the Corporation have reduced the price of gas by giving 20 per cent. discount to all consumers, wages have been increased by 10 per cent., and coal, oil, and other materials have also risen considerably. Notwithstanding all these unfavourable circumstances, the profits in 1913-14 were £63,285. These figures show the great advance in the present methods of gas making as compared with those in use a few years ago.

In the coal-gas section, 119,060 tons of coal were carbonized in the period named, making 1478 million cubic feet of gas at a cost of £107,909. The coal bill for 1913 was £93,685—an increase of £14,224. Considerable reductions have, however, been made in the cost of carbonization and purification. The water gas made in 1913-14 was 1050 million cubic feet, which was 41 millions less than in 1912-13. The total cost of oil was £28,767, compared with £15,595 for the previous year, showing an increase of £13,172, though 300,000 gallons less were used. There was, however, a saving in the cost of purification in this section. The increase in revenue from the sale of gas was almost £4000; about 33 million cubic feet having been sold more than in 1912-13. The coke sold increased by upwards of 5000 tons; but, owing to the reduction in price, the Committee received £6000 less from customers. A very successful year was experienced in the stove department; the profit realized being £440. The net increase in cookers and heaters was 1829.

According to the profit and loss account, after paying dividends, sinking fund, and the cost of the 28th issue of stock, there was set aside to the reserve for insurance £1600, to the contingent renewal fund £3000, to the cost of the Belfast Corporation Act, 1912, £1765, and to the cost of arbitration £1394. There had also been contributed £10,000 to the general purposes fund in aid of the rates, and £11,432 to pay dividends and sinking fund on the New City Hall stock.

THE BLACKBURN GAS ENGINEERSHIP.

Statement by the Vice-Chairman of the Gas Committee.

In a letter dated Friday last, Mr. John Shorrock, who for the last seven or eight years has been Vice-Chairman of the Blackburn Gas Committee, states that no small interest has been taken by the public in respect to the resignation of Mr. S. R. Ogden as Engineer and Manager of the gas undertaking. Thinking it only right, as one who had been in touch with the management for many years, that the public should be put in possession of the actual facts, he quoted in full the letter of resignation sent by Mr. Ogden.

In this Mr. Ogden said that he was informed that at a Special General Purposes Sub-Committee meeting to consider the reports presented by Sir Corbet Woodall and himself, a strong expression of opinion was advanced that there should be a change in the management. The grounds upon which this opinion were based had not been divulged; but he submitted that there was nothing contained in Sir Corbet's report which in any way inculpated the management. The members of the Gas Committee were fully aware that the recommendations therein set forth had been before them for some time, along with others; but he could not be responsible for these not being adopted and carried out. Last May he completed thirty years' service under the Corporation—21 years as Engineer and Manager, nine years as Assistant. When he became Manager the output was 600 million cubic feet a year; while two years ago it had mounted up to 780 millions. The price of gas had come down from 3s. 7d. to 2s. 9d. per 1000 cubic feet. To obtain these results large sums had been spent on renewing and extending the plant in various departments, at a cost of nearly £100,000, taken from revenue account, which ordinarily would have gone to capital. In purification alone the costs per annum had dropped over £1000, owing to a device of his own, now largely in use over the country, but unfortunately not patentable. In his opinion, the results had been highly satisfactory; and had the opportunities and encouragement been given him which he ought to have had, the department would have shown considerably better results.

"Anyone reading this letter," states Mr. Shorrock, "must be struck with the significance of the fact that no reason for the resignation is given. No doubt the reason which would occur off-hand to those not in touch with the facts would be that it was owing to the report of Sir Corbet Woodall; but in the report, as the Engineer states, there is nothing that in any way censures the management, and he explains that the whole of the points raised in the report were placed before his Committee by him and discussed long before there was any suggestion of an expert being called in. The increase during his years of service, the reduction in the price of gas, capital, and expenditure from revenue account, speak for themselves. From my own personal knowledge, I fully agree with the whole of the points put forward by the Gas Engineer, knowing them to be true and accurate; and I deem it my duty, as his former Vice-Chairman, to place the facts clearly before the public in order to avoid, if possible, a gross wrong being inflicted upon a servant who has faithfully and ably served the Corporation of Blackburn for upwards of thirty years."

NOTTINGHAM GAS RESERVE.

Financing the Trent Navigation Scheme.

Although it had been thought that, for twelve months at any rate, the project for laying under contribution the gas reserve and other funds of the Nottingham Corporation trading concerns, in support of a scheme for improving the navigation of the Trent, had been disposed of in a manner unfavourable to its authors, the matter was revived at a special meeting of the Corporation last Wednesday. At a previous meeting, there had, as already recorded, been a failure to obtain the required statutory majority in favour of the undertaking. The Special Committee having charge of the matter evinced, however, a determined disinclination to relinquish their purpose; and on Wednesday, by a vote of 42 in favour of the project—this constituting more than the necessary majority—it was decided to push on with it in the next session, by promoting a Bill under which the Trent Navigation Company are to cede to the Corporation certain of their statutory rights in the river between Nottingham and Newark—the idea being to convert Nottingham into an inland port for dealing with traffic between this part of the Midlands and the Humber. The Corporation undertake to widen and deepen the Trent between Nottingham and Newark, and to construct new locks and other works, at an estimated expenditure of about £150,000.

There were no new arguments forthcoming in support of the proposal; and former contentions against annexing gas reserves were not seriously controverted. But as an element contributing to the decision, a further report by the Special Committee was submitted, wherein it was stated that since the last meeting an agreement had been come to with the Company by which the latter had undertaken to hand over yearly to the Corporation all profits of their carrying and towing business in excess of the profits of the year 1913, if, and so long as, the revenue accruing to the Corporation in respect of the portion of the navigation taken over by them does not amount to 3¾ per cent. on the outlay.

Apart from the criticism which has been forthcoming as to the extremely problematical financial advantages of the project, a very strong feeling is being demonstrated in representative municipal quarters, as to mortgaging the reserves of the Corporation trading undertakings, and particularly the gas fund.

GAS PRICES AT OLDBURY.

Two-Meter System to be Abolished.

At a Meeting of the Oldbury District Council on Friday evening, under the presidency of Mr. J. W. D. PRATT, the discussion on the affairs of the gas undertaking was continued [see "JOURNAL" for Dec. 8, p. 553]. The Gas Committee reported that they had reconsidered the question of the price of gas for cooking, and recommended that it be 2s. 6d. per 1000 cubic feet for future installations. In cases where separate meters were at present used for cooking, these meters should be removed at the convenience of the Committee; that a discount of 5 per cent. should be allowed on one-half of the gross accounts in such cases for the next three years; and that all special arrangements which had been in force should cease.

Mr. WALLACE, referring to the recommendation that all special arrangements in connection with gas for cooking purposes should cease at the expiration of three years, asked whether the Council could bind their successors to such a policy at the end of this period. The Gas Committee had made an arrangement with old consumers; and they ought to stand by it. He moved that the words "three years" be deleted from the report.

Mr. S. BEACH seconded, and agreed that the Council ought to stand by the old arrangement made by the Gas Committee.

Mr. WILSON said the Committee had only tried to give expression to the wishes of the Council at the last meeting, when it was felt that the old arrangements should not suddenly terminate. They thought they were dealing fairly with these old consumers in their present recommendation. The Council also expressed a wish that the two-meter system, with its complications, should be abolished; and this the Committee had taken seriously in hand. The extra discount of 5 per cent. for three years was a very satisfactory arrangement.

Mr. ROUND remarked that unless a time limit was put upon those who had two meters, they would be getting their gas at less cost than, and would consequently have a considerable advantage over, those who had installations later on.

Mr. WALLACE replied that a lot of people had a second meter put in at their own expense, on the understanding that the Committee made a reduction in price. Ultimately, however, he withdrew his amendment.

The Committee's recommendation was then approved.

POSITION OF THE COALITE COMPANIES.

The Annual Meeting of the British Coalite Company, Limited, was held last Tuesday—Mr. James Todd presiding. In moving the adoption of the report, the Chairman pointed out that the capital had been withdrawn by £977,305. If their process should turn out to be satisfactory, the value of their patents would total much more than the sum on the liability side of the accounts. They were anticipating that the option to purchase the Barking land would be exercised; and in this case the whole of the first debentures would be released. The considerable increase, however, which had taken place since the commencement of the war in the trade of the Port of London foreshadowed a much greater development when the world's shipping ran on uninterruptedly; and if the Barking land was not sold, possibly a much higher value might attach to this desirable and unique area for business purposes. The war had interfered with their negotiations for the provision of capital to enable them to proceed with the erection of their first colliery installation at the Old Silkstone Collieries. They were hopeful, however, that when they were in a position to demonstrate the value of their process to colliery people, by actual results from the test plant now in course of erection at Barnsley, there would not be much difficulty in raising the necessary money. An attempt was being made to capture this part of the trade of Germany, which had hitherto benefited enormously from the manufacture of coal-tar products; and in this connection he might mention that their process lent itself especially to the production from coal of a rich series of residuals which were very valuable in the manufacture of synthetic dyes, and which should also prove an important factor in the development of a new explosive. Directly they had demonstrated to one colliery company the value of their process, the way would be clear and made easier for them to deal with others. The report was adopted.

Presiding at the ordinary general meeting of Coalite Limited, also held last Tuesday, Mr. A. M. H. Walrond, the Chairman, said the accounts did not show the effects of the reorganization of the British Company, which had been completed during the past year, and which would influence their figures very considerably. He had every confidence that the small plant which was being erected by the British Company at Burnley, and which would shortly be completed, would enable them to show to anyone who cared to investigate the matter that the claims made for their process were perfectly sound, and would, he hoped, attract people with money to invest. The report and statement of accounts were adopted.

MANCHESTER SMOKE ABATEMENT LEAGUE.

Second Annual Report.

The Second Annual Report of the Manchester and District Coal Smoke Abatement League contains a reference to the campaign against the smoke nuisance in the city, and also alludes to the suspended sittings (owing to the war) of the Departmental Committee on Smoke Abatement, allusion to which was made in the Retrospect of 1914, on p. 715 of the last number of the "JOURNAL."

After stating that the Departmental Committee was appointed "to consider the present state of the law with regard to the pollution of the air by smoke and other noxious vapours and its administration, and to advise what steps are desirable and practicable with a view to diminishing the evil still arising from such pollution," the report goes on to say that no doubt when the pressure of work of the Local Government Board is reduced, the sittings will be renewed, and it is hoped that a valuable report will finally be issued. The League are strongly of opinion that, though Lord Newton's Bill is undoubtedly on the right lines, there is still lack of definite information as regards the practical steps that can be taken to secure the abatement of smoke. The first step towards a proper solution of the problem is, they say, undoubtedly an inquiry such as is now being undertaken by the Departmental Committee; and they consider its appointment to be by far the most important and promising step which has for many years been taken in connection with smoke abatement. After reference to the work of the District Smoke Inspector for the last twelve months, and to the co-operation of manufacturers in keeping down black smoke emissions, the report says that a good deal of time has been spent during the past year in endeavouring to get the steam-raisers of Manchester to form a league, with the object of improving the efficiency of their boiler plants, and at the same time making them less smoky. Similar leagues are stated to exist in other parts of the world, and to be found very advantageous to manufacturers who belong to them. About eighty firms of manufacturers have expressed themselves interested in the idea; but the outbreak of the war unfortunately rendered it impossible to go on with the scheme for the present. It is hoped that it will be revived later on.

Dealing with the question of domestic smoke, the report continues: "There can be no doubt that gas supplied at the cheapest possible rate is the most hopeful and practical remedy for domestic smoke. Unfortunately, in Manchester the Gas Committee are forced to pay over a large sum each year in relief of the rates, so artificially keeping up the price of gas. The question of the contribution of the Gas Committee in relief of rates was brought before the Council in April, 1914; and in view of the importance of the occasion, a circular was sent out by our Committee to every member of the Council, urging them to support the reduction of this tax on gas. We are pleased to say that the Council decided to fix the Gas Committee's contribution at £50,000 for the next three years, which was a reduction, though small, on the proposals of the Finance Committee. Hitherto this contribution has been fixed roughly on the basis of the maximum amount which the Gas Committee could afford. The Finance Committee had again made recommendations to the Council on these lines; but after some debate the Council decided to fix the contribution at a lower figure than that recommended by the Finance Committee."

AMERICAN SULPHATE PRODUCTION IN 1913.

We have received from the American Coal Products Company, of New York, a pamphlet on the production of Sulphate of Ammonia in 1913. It is on the lines of the "Review" issued annually by Messrs. Bradbury and Hirsch, of Liverpool, and contains similar tabulated statistics. Particulars are given in regard to the United Kingdom, Germany, the United States, France, Japan, and Russia; and the following are extracts therefrom.

In their introductory remarks the authors state that the production of sulphate of ammonia during the season 1913-14 registered an increase, though not so large a one as previous records had given some ground to expect. While Germany may have rather exceeded expectations, the increase in the United Kingdom just about equalled them, and that in the United States was not up to the mark of previous performances. The outbreak of war in Europe has profoundly disturbed all existing industrial conditions. We may be reasonably certain, however, that several years will elapse before the high-water mark of the world's production in the year 1913 will be again reached, and that Germany, by far the largest producer, apparently secure for the time being in that position, will hardly hold that place until some time after hostilities shall have ceased.

While, roughly speaking, one-third of the world's ammonia output is obtained in illuminating gas manufacture, which being a public utility is not so liable to interruption as ordinary manufacturing enterprises, the remaining two thirds is derived from private industries, mainly from the bye-product coke-ovens operated in connection with the manufacture of iron and steel. The prosecution of warfare does not help the steel industry, and the paralyzing influence is felt in other countries than those actually engaged.

The world's production of ammonia, reckoning all forms as sulphate, is estimated at 1,409,000 metric tons in the year 1913—an increase of 156,000 tons over the 1912 output. Taking the output of Chilean nitrate at 3,018,400 net tons for the year 1913, the production of sulphate of ammonia is a little short of half as much. Basing the comparison on the nitrogen supplied (some 771,350 tons), sulphate of ammonia contributed 319,600 tons, or 40·5 per cent.—about the same as the year before.

Considerable progress has been made in the extension of the use of sulphate of ammonia as a fertilizer, which is by far its largest single use. Development in this direction is assured by the efforts of agricultural demonstration agents, who carry on systematic experiments calculated to spread among the farmers information as to its properties and beneficial results. Such work is now carried on in Germany, Austria-Hungary, France, England, Belgium, Holland, Switzerland, Denmark, Sweden, Russia, Spain, Italy, the United States, Mexico, Egypt, Palestine, and India.

After some remarks on the sources of ammonia, particulars are given of the production of sulphate and its equivalent in the United Kingdom. These have already been furnished by Messrs. Bradbury and Hirsch. Coming to Germany, it is stated that in 1910 the output there was equal to that of the United Kingdom; next year she was definitely in the lead; and in 1913 an addition of 56,000 tons was made to the production of ammonia, reckoning all forms as sulphate, following one of 74,000 tons in the preceding year—an increase of some 130,000 metric tons in two years. According to the annual report of the Deutsche Ammoniak-Verkaufs-Vereinigung, of the total quantity of sulphate of ammonia used in Germany in 1913 (460,000 tons), about 135,000 tons were absorbed by the eastern portion—that is to say, the Kingdom of Saxony, the Province of Brandenburg, the two Grand Duchies of Mechlenburg, and the Eastern Prussian provinces, having a total area of the most important crops of (in round figures) 10 million hectares. The western territory, including Schleswig-Holstein and Southern Germany, with an area of about 13 million hectares devoted to the principal crops, absorb 325,000 tons of sulphate of ammonia. Therefore in the last-mentioned district the consumption of sulphate is at present about 25 kilos. per hectare (22 lbs. per acre), whereas in the eastern part of Germany it is, on an average, only about 13½ kilos. per hectare (10½ lbs. per acre). The production of sulphate of ammonia by the synthetic method progressed from the experimental stage to that of practical operation in the year 1913. There was also an increase in the production of lime nitrogen (calcium cyanamide), Norwegian saltpetre, and artificial sodium nitrate, as well as the production of sulphate of ammonia from calcium cyanamide—all closely depending upon continued progress in the development of hydro-electric power plants.

With regard to the United States, a relatively large advance in production was made in the year 1913; the figure being 195,000 net tons of sulphate of ammonia and its equivalent, compared with 165,000 tons for the year 1912—a gain of 30,000 tons, or 17 per cent. This is stated to be next to the largest increase reported. Of the 195,000 tons produced, 153,000 tons were chargeable to the bye-product coke-ovens—being 23,000 tons more than the year before—and 42,000 tons to the coal gas and bone carbonizing works, or 7000 tons more than the preceding year. The percentage of bye-product oven coke is 78·5, against 79 before. This indicates an increase in the use for illuminating purposes of coal gas in place of carburetted water gas.

The additions to the operating bye-product coke-ovens for 1913 comprise 54 Semet-Solvay ovens at Ashland (Ky.); 68 Koppers ovens for the Republic Iron and Steel Company, at Youngstown (Ohio); 36 United Otto ovens for the North-Western Iron Company, at Mayville (Wis.); 66 Koppers ovens for the Inland Steel Company, at Indiana Harbor (Ind.); and 22 Klönne ovens at Muncie (Ind.). Besides this additions to existing plants include 40 ovens at Delray (Mich.), 51 at Cleveland (Ohio), 80 at South Chicago (Ill.), 20 at Tuscaloosa (Ala.), and 80 at Woodward (Ala.). In 1914 the 41 Semet-Solvay ovens at Indianapolis were completed and placed in operation, also 27 Gas Machinery Company's ovens at Johnstown (Pa.), 120 Koppers ovens at Sparrows Point (Md.), and 18 Wilputte ovens at Joliet (Ill.). In addition to this there were 224 Koppers ovens under construction at Bethlehem (Pa.), 56 similar ovens for the Laclede Gas Company, at St. Louis (Mo.), and 100 Otto ovens by the Otto Coking Company,

at Buffalo (N.Y.). Of the ovens at Bethlehem, 106 are expected to be in operation early in the present year; but these and the ovens at Sparrows Point will not, it is stated, add greatly to the total production of ammonia, as they are replacements rather than increases.

The production of ammonia in France in 1913 was 74,500 metric tons—an increase of 6000 tons over the preceding year. Of this, 1700 tons are due to the gas-works and 4500 tons to the bye-product coke-ovens. The consumption may be approximated from the following figures: Imports, 25,145 metric tons; production, 74,500 tons—99,645 tons. Exports, 2761 metric tons; available for consumption, 96,884 tons.

Japan, now for some years past England's largest customer, maintained her position in this respect for the year 1913, importing more—123,911 net tons, compared with 93,999 tons in 1912 and 82,491 tons in 1911—than ever before. While the official figures are not at hand for the production in 1913, it is estimated at 19,000 tons, against 16,793 tons in 1912.

The use of bye-product coke-ovens in Russia is increasing; the number in operation in 1913 being given as 1027. There has been a corresponding increase in the production of ammonia, the output of sulphate being given as 13,663 net tons in 1913, compared with 4000 tons in 1912 and 416 tons in 1911. It is further stated that the coke produced by the recovery ovens is only 50 per cent. of the total coke made; so that there is room for an increase in ammonia production apart from the natural expansion in coke requirements.

The bulk of the ammonium sulphate made in Russia is exported principally to Southern Europe.

UNITED STATES COAL-TAR DYE INDUSTRY.

Report by the American Chemical Society.

An influential Committee of the New York Section of the American Chemical Society was formed recently, under the chairmanship of Dr. Bernhard C. Hesse, to report upon the conditions involved in the development of the United States coal-tar dye industry. They have issued their report, and in the course of it make the following remarks.

It has been conclusively demonstrated during the past thirty years that the present tariff rate of 30 per cent. on dyestuffs is not sufficient to induce the domestic dyestuff industry to expand at a rate comparable with the consumption of dyestuffs in the United States, and that therefore all dyestuffs made from coal tar, whether they be aniline, alizarine, or anthracene dyes or indigo, so long as they are made in whole or in part from products obtainable from coal tar, should all be assessed alike—viz., at 30 per cent. *ad valorem* duty *plus* 7½ c. per pound specific; and that all manufactured products obtainable from coal tar, not being themselves dyes or colours and not medicinal, should be taxed 15 per cent. *ad valorem* and 3¾ c. per pound specific.

The best information and judgment the Committee can obtain is that the above manufactured products of coal tar should carry one-half the duty of the finished coal-tar dye, and that the rate of 30 per cent. *ad valorem* and 7½ c. specific would probably be sufficient to encourage and enable domestic manufacturers to expand their operations to such an extent as to supply a very material increase in, if not the whole of, these commodities consumed in the States. The reason for a specific duty is to protect the domestic manufacturer in the manufacture of the relatively cheap dyes—such as scarlets, yellows, and the like—the prices of which abroad are in the neighbourhood of from 12 c. to 20 c. per pound. With dyes of this type, 30 per cent. *ad valorem* would not offer so serious an obstacle to importation and underselling as does the 7½ c. per pound specific. On the other hand, on dyes of which the prices are $1 and upwards per pound, the function of the 7½ c. specific more nearly approaches zero.

This is said to be the price the nation will have to pay to have a complete self-contained and independent coal-tar chemical industry. However, it must be remembered that if such an industry be created, and importation of coal-tar products (inclusive of intermediates and dyes) is restricted, its ultimate effect upon the Federal revenues will have to be considered. It will therefore be necessary to determine carefully if the advantages to be gained are equal to the price to be paid.

The United States can produce so-called coal-tar raw material in amounts sufficient for the needs of a complete domestic coal-tar chemical industry—inclusive of explosives and dyes—provided there is a certainty of outlet as to volume and continuity. Those engaged in manufacture do not want to expand unless the dye users are willing to make corresponding contracts. In other words, it is a closed circle. If the dye users will contract sufficiently with the dye makers, the latter will contract with the coal-tar distillers and the industry will take a start. The initiative rests wholly with the users. If they cannot afford to contract, the dye makers and the distillers cannot afford to make their contracts and additional investments.

THE ROMANCE OF COAL TAR.

To the columns of the "Manchester Guardian," a correspondent has contributed an article in the course of which he says that the history of coal tar is one of the most interesting romances of science. Its discoverer, Johann Becker, a German chemist, more than 200 years ago laid the foundation upon which one of the most remarkable stories of Applied Science is built. He discovered a method of extracting tar from coal, leaving the latter after the tar was extracted as useful as before for ordinary purposes. He applied to coal the process of destructive distillation. In this country over 15,000,000 tons of coal

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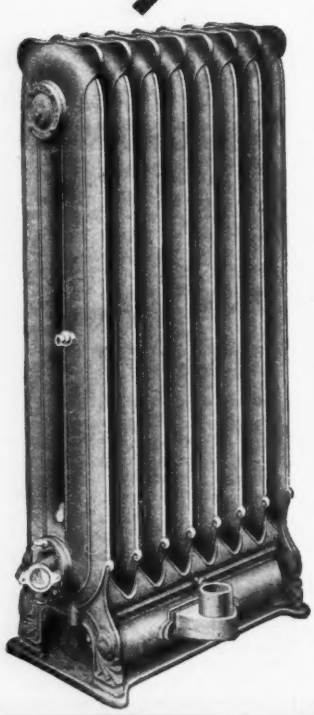

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are treated annually, and produce nearly 1,000,000 tons of tar; the products of the tar being subsequently of the value of about £7,000,000. Evil-smelling and unsavoury as this tar is, it is the rough material from which many valuable substances are obtained—substances the most diverse in character, triumphs of the chemist's patience and skill, indispensable factors in the most essential arts and industries of life. They include a wide range of colours, and an equally wide range of perfumes, flavours, and medicines, various kinds of burning and lubricating oils, photographic developers, asphalt for pavements, and the most powerful explosives.

When gas was being introduced as a new light in the early days of the last century, tar was almost a waste product. Frederick Accum, whose "Treatise on Gas Lighting" opened the eyes of London to the advantages of the new illuminant, suggested the boiling of tar in a still, and the condensation and collection of the volatile products. The process yielded two kinds of oil—one heavy, the other light and volatile. The heavier oil was used as a preservative for wood that had to be fixed underground (such as telegraph poles) or submerged in water (as the logs of piers and bridges). The lighter oil was found useful in many ways. A Glasgow chemist, Macintosh, used it in waterproofing the clothing which still bears his name. It was employed as a solvent in varnish making, and, as coal-naphtha, was used for lighting purposes. The subsequent discovery of what this naphtha contained was like the finding of a hidden treasure, a rich treasury of colours which for myriads of centuries had been locked-up in coal and its despised refuse, tar. The discoverer was Hofmann, of the Royal College of Chemistry. From the naphtha he extracted benzene; and from benzene the most lustrous shades of violet, yellow, blue, and green are derived. But it was Hofmann's pupil W. H. Perkin (afterwards Sir William Perkin) who made the manufacture of benzene on a commercial scale possible. He was only eighteen years of age when he produced his mauve dye experimentally. He was experimenting on the artificial production of quinine; and in using a base known as aniline, he obtained the colouring matter which he called "mauve." The discovery of benzene and the various resulting dyes revolutionized the colour industry. Years before Perkin's discovery, aniline had been obtained from the indigo plant "anil." The discovery of mauve created a large demand for the artificial aniline base, and gave quite an unexpected value to Hofmann's benzene. It yielded aniline by being treated with nitric acid and with the borings of cast-iron powdered into a dust. Having done its work in the aniline still, the dust was used by the gas maker to cleanse his coal gas from sulphur; and then it passed to the manufacturing chemist, who burnt the sulphur out of it and produced sulphuric acid—a cycle of operations whose beginning and end was the utilization of waste. The discovery of mauve laid the foundation of the coal-tar colour industry; and at the present time almost every shade of colour is derived from aniline. The processes employed are innumerable; the names of the dyes endless.

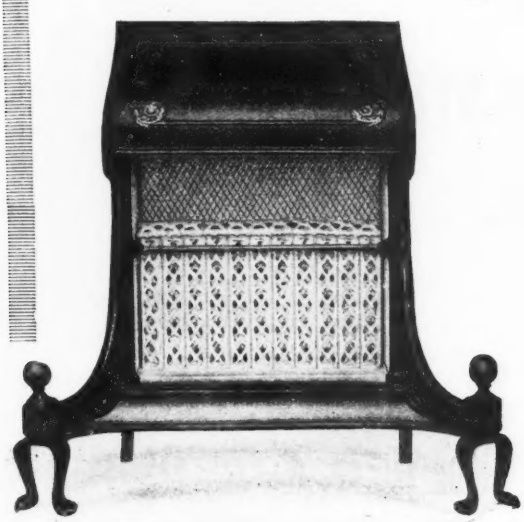
Perkin, too, was responsible for the desolate madder fields of France and Holland and for the loss to the poor Hindoos of their long-cherished indigo cultivation. The utilization of one of the heavier oils of coal-tar—anthracene—killed the madder-growing industry. Anthracene was sold quite cheaply for lubricating purposes until the chemists Graebe and Liebermann heated it with zinc filings, and produced what they called alizarin; and thus the secret of the madder plant was discovered. Madder was then about £50 per ton, and we imported nearly 200,000 tons yearly. The genius of the chemist changes all. Chemistry displaces an agricultural art—a pound of alizarin having the colouring power of 90 lbs. of madder; and the lubricating oil sold at a trifle as waste becomes a valuable colouring matter worth £100 per ton, creating an industry valued at some millions annually. In 1862, when Perkin's success was new, his teacher Hofmann wrote that at no distant date England would become the greatest colour-producing country in the world. Hofmann was a better chemist than a prophet. France first took up the manufacture on a large scale; but France soon fell behind the scientific and technically-trained German, subsidized by his Government. Now special efforts and a huge expenditure will be required to win-back a trade which might never have left this country.

The products of coal tar are not confined to colours. The smell of coal tar is the last thing in the world to suggest new-mown hay, yet Perkin made the perfume from a tar product. One of the most popular natural perfumes—cumarin—(not so much used now as some years ago) was made from vegetable substances, vernal grass or woodruff. It is now made from carbolic acid. A most widely used flavouring for cooking purposes—vanilla—was prepared from a bean. It is now obtained from the vanillin of the gas-works, and even this vanillin can be made into a heliotrope perfume by the addition of oil of almonds, while the latter can be produced by treating benzene with an acid. Huge quantities of this oil under the name of essence of mirbane are used every year in the manufacture of scented soaps. In medicine and surgery, too, the products of coal tar have been beneficial. Diabetic patients use saccharin, Fahlberg's wonderful product, many hundred times the sweetening power of sugar. Carbolic acid is separated from the oil of coal tar by many successive distillations; and in surgical operations a spray of germ-killing carbolic is used. It prevents mortification and saves life. Quinoline, antipyrine, and other fever assuagers are made from coal tar; and various antiseptics and food preservers are also obtained from it. Things that fifty years ago could only be produced in the laboratory in the smallest quantities can now be obtained in huge quantities from coal tar—things mutually antagonistic, too. There is hardly a department of life into which the products of coal tar do not enter; and seeking for romance in the most unlikely and prosaic quarters, we surely find it here.

Mr. Fred Wilkinson, of Aldershot, has been appointed by the Redhill Gas Company to the position of Sales Superintendent to take charge (under the Engineer and Manager, Mr. W. H. Bennett) of the whole of the distribution work in the Company's area.

1914—A Retrospect.

The "Journal of Gas Lighting," in its retrospect of 1914, says:



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GAS COKE FOR DRIVING MOTOR OMNIBUSES.

The National Steam Car Type.

At the Fourth Annual Meeting of the National Steam-Car Company, Limited, held last Tuesday under the presidency of Mr. Thomas Clarkson, the Chairman and Managing-Director, he referred as follows to the trials which had been carried out with the view of utilizing gas coke for driving motor omnibuses.

You may remember that when I last had the privilege of addressing you, reference was made to the investigations directed towards the employment of a cheaper fuel. These investigations, I am glad to report, have been brought to a successful conclusion. After many experiments, one of our motor omnibuses was adapted to use ordinary gas coke as fuel, instead of paraffin, at less than one-third the cost. Between this achievement and the actual running of a bus in service with the new fuel, a considerable interval was unavoidable—owing to the prolonged tests (both mechanical and chemical) which were conducted by the experts of the Chief Commissioner of Metropolitan Police, in order to satisfy his legitimate requirements that a bus using coke fuel should be in every way suitable for service in the streets of London. I am glad to report that after such a severe ordeal our coke motor-bus has been approved for service. One of these buses has been running for some time; and a careful observance of its performance under service conditions indicates to me a very important future for this type of motor in passenger service. The suitability of this motor for the economical transport of merchandise has also been kept in view; and at the Whit Monday parade of the Commercial Motor Users' Association this year one of our coke motor lorries was exhibited for the first time. For this a silver cup was awarded to us. Trial orders for coke motor lorries were soon received. A London gas company, after making a lengthy test of one of these motors, has favoured us with an order for six more. Such a repeat order furnishes the best testimony of the practical success of the coke fuel motor. Our figures for the remarkably low cost of fuel with the coke motor were regarded by some motor transport experts as too good to be true. In order, therefore, to set this question at rest, we decided to submit a coke motor to the Expert and Technical Committee of the Royal Automobile Club for the purpose of an official trial and to obtain a certificate of actual performance. The test was carried out during the latter part of July, with the result that the fuel economy recorded at the official trial was more than 25 per cent. better than we had previously claimed. About a month ago we received notification from the Secretary of the Royal Automobile Club that the Expert and Technical Committee, having considered all the trials made by the club during the year ended the 15th of October, had selected our national coke motor trial as the most meritorious performance; and in consequence of this we were awarded the Dewar Trophy, which you now see before you.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

At a recent meeting of the Works Committee of the Edinburgh and Leith Gas Commissioners, the report submitted by the Engineer and Manager (Mr. Alexander Masterton) for the month of November showed that the quantity of gas made was 227,457,000 cubic feet, compared with 235,749,000 cubic feet in the corresponding month of 1913—a decrease of 3·51 per cent., against an increase of 1·36 per cent. The make in the period from the 16th of May to the 30th of November was 970,533,000 cubic feet, against 977,451,000 cubic feet in the corresponding period of 1913. Up to the declaration of war, the output of gas showed a very satisfactory increase; but since then, owing to diminished public lighting, &c., there has been a falling-off, which has slightly exceeded the previous increase. The actual set-back since the 16th of May to the 30th of November is 0·71 per cent. At a meeting of the Finance and Law Committee on the same occasion, it was reported by ex-Bailie Reid that, in conjunction with Councillor White, he had attended a meeting of the Consumers' Ledgers Sub-Committee, and had gone over and destroyed the irrecoverable accounts. The loss in bad debts was equal to 2s. 5½d. per £100, which is the lowest rate for many years.

Early in October last, about sixty tinsmiths employed by Messrs. R. Laidlaw and Son, Limited, went out on strike because they would not continue to work under their foreman. A request made to the firm was not acceded to. The matter was then brought to the notice of Sir George Askwith, who in a letter to the Secretary of the Sheet Metal Workers' and Braziers' Union wrote as follows: "I have been in communication with Messrs. Laidlaw with reference to the dispute at their works, and have received from them the assurance that they favoured inquiry being made into the question in dispute, and would abide by the result; and they contend that, short of such an inquiry and the establishment of the men's case, it would be a grave injustice to take sides against their foreman by disrating him. In reviewing the matter from the information I have received from interviews with you and Mr. Payne, the firm's representative, the position appears to be that your members are of opinion that the conduct of the foreman has been such as makes it impossible for them to continue in Messrs. Laidlaw's employment while this foreman is in charge. It is, of course, in the rights of the men to take such action; but it places Messrs. Laidlaw, who, I understand, are good employers, in an extremely difficult position if, to enable their business to proceed, including the fulfilment of War Office and Admiralty contracts, and to secure the return of their workmen, they are called upon to disrate this foreman. It is, I think, due to them that they should be satisfied that the case against the foreman is sufficiently strong to warrant such an

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action. So far they are not so satisfied, but they offer to have the matter investigated by an impartial inquiry, and will abide by the result. It seems to me that, whatever the case against the foreman may be, it is not more than conceding justice that they should have an opportunity to meet the charges made against them." In reply to this, the Secretary of the Association wrote that the Committee and members had decided by a unanimous vote that they could not accept the proposal for submitting the question at issue to inquiry as had been suggested to them.

Last Wednesday the members of the electrical trade in Edinburgh sent to the Corporation a representation against the clause in the proposed Provisional Order for the city, at present under the consideration of the Council, by which the latter propose to apply for special powers to supply or hire all electrical apparatus, except for lighting, to fit it up, to open show-rooms or shops throughout the city for this purpose, and to use public money for the advertisement and promotion of the scheme. The representation is signed by almost a hundred firms in the trade, and also by 35 firms on behalf of the members of the Edinburgh, Leith, and District Ironmongers' Association. The representation reminds the Council that a somewhat similar proposal was before them only two years ago, in connection with the Provisional Order of 1913, when it was defeated by a large majority. It is urged that the supply of electrical appliances, unlike the supply of electrical energy, is not a monopoly, and consequently is not a suitable field for municipal activity; that Edinburgh is already extremely well provided with electrical show-rooms in all parts of the city by private traders; and that the proposals would be no advantage to the Corporation or the general body of the ratepayers, and would do incalculable damage to an industry of the city which employs a large number of workers, occupies business premises of considerable rating value, and in which many ratepayers have sunk their capital from time to time for some years past.

An explosion of an unusually alarming nature, which resulted in slight injuries to a policeman and two tramcar drivers, occurred on Christmas night, about half-past six, in West Nile Street, Glasgow. Three manholes blew out simultaneously at points situated at intervals of fully 50 yards. The explosions took place at the Sauchiehall Street, Bath Street, and West George Street crossings in West Nile Street; that at the Sauchiehall Street corner being the most serious. Here the heavy metal covering of the manhole was blown into fragments; and pieces were thrown high in the air, and fell in a hail of splinters in all directions. There was an impression among pedestrians that a faint flare was visible at the moment of explosion; but no flames issued from the hole. The accident was due to an accumulation of gas in the tunnel to which the manholes gave entrance. The gas-main runs parallel under the footway; and it is thought that the escaping gas found its way into the tunnel by means of the electric cable ducts. Corporation workmen were promptly on the scene. It was found that, beyond the wrecking of the manhole covers, no damage was done to the cables or other pipes.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 4.

There is a certain amount of inquiry for pitch, but business is difficult to arrange, as buyers' ideas of values are rather below those of sellers at the present time. The price is quite nominal. Sixties crude carbolic acid remains steady at about 3s. per gallon, casks free, and creosote at 4d. per gallon net, in bulk, at sellers' works. Solvent naphtha is in good demand, and the price for 90-160 is firm at 1s. per gallon net, casks free. Pyridine is still 8s. 3d. per gallon net, in buyers' drums; anthracene, 40-45 per cent., 2d. per unit net, casks free.

Sulphate of ammonia continues to improve, and the price to-day is firm at £11 15s. per ton net and naked at makers' works for 25 per cent. quality.

Tar Products in the Provinces.

Jan. 4.

There has not been very much activity in the markets for tar products during the past week. Pitch has shown signs of weakening, and sales are reported at lower prices. There is no change in benzol. Some good figures are reported to have been paid for solvent naphtha, and the market shows signs of improvement. Creosote is quiet, though prices remain steady. Business is reported in crude carbolic at 2s. 11d. to 3s. per gallon.

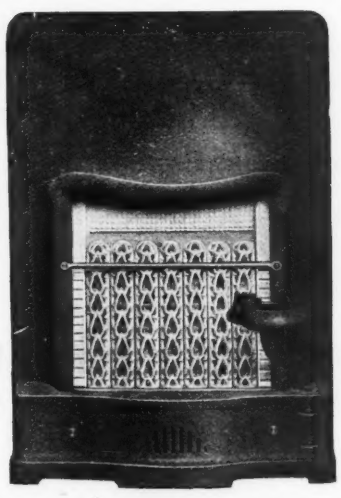
The average values during the week were: Value of liquid products in one ton of tar, 17s. to 18s. 6d. Benzol, 90 per cent., naked, North, 8½d. to 9d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. to 2s. 4d. Crude naphtha, in bulk, North, 5¼d. to 5⅝d. Solvent naphtha, naked, North, 10½d. to 1s. Heavy naphtha, naked, North, 11d. to 1s. Creosote, in bulk, North, 3⅜d. to 3 7/16d. Heavy oils, in bulk, 4d. to 4¼d. Carbolic acid, casks included, 60 per cent., East and West coasts, 2s. 11d. to 3s. Naphthalene, £6 to £11; salts, 65s., bags included. Anthracene, "A" quality, 2d. per unit; "B," nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Jan.* 1.

Although the market for this material has naturally been rather less active during the holidays, the tone has continued strong, and another rise in values has to be recorded. Closing quotations are £12 2s. 6d. per ton f.o.b. Hull, £12 5s. per ton f.o.b. Liverpool, and £12 7s. 6d. per ton f.o.b. Leith. For future delivery producers are very firm in their views, and now require a premium of 2s. 6d. per ton on prompt prices for January-June shipment; but no first-hand business has transpired.

THE "LANCET" REPORT ON PARKINSON GAS FIRES.



"These were all well designed and attractively finished fires, and not one of them showed the slightest escape of combustion products, either when tested in the open, unattached to a chimney, or when unprovided with a flue or elbow.

We regard these fires, therefore, as being satisfactory from the hygienic point of view."

(Extract from the "Lancet," Nov. 14th, 1914.)

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Nitrate of Soda.

The market for this article remains steady at 10s. per cwt. for ordinary, and 10s. 6d. for refined quality on spot.

Sulphate of Ammonia.

From another source it is reported that this market has remained very firm throughout the past week, and sales are reported at better prices. Outside London, makes are quoted at £11 2s. 6d. to £11 5s.; Hull, £11 17s. 6d. to £12; Leith, £12 to £12 2s. 6d.; Liverpool, £12; Middlesbrough, £11 17s. 6d. to £12.

COAL TRADE REPORT.

Northern Coal Trade.

There is a good demand for coal; and now that the production has risen after the holidays and steamers are more plentiful, the shipments are fuller than they were. In the steam coal trade, the exports are not heavy, but there is a better local inquiry. Best Northumbrians are from 13s. 1½d. to 13s. 3d. per ton; second-class steams are from 10s. 9d. to 11s. 3d. per ton; and steam smalls are in fair request at 7s. 3d. to 9s. per ton. Some railway contracts have been settled at a slight reduction on the prices in the expiring contracts. In the gas coal trade, the demand is good for home use, and there is a fair export to France and Italy, though the high freights make the prices high for coals delivered at oversea ports. Best Durhams are firm at 12s. 6d. per ton f.o.b.; second-class gas coals are 11s. to 11s. 3d. per ton, with a fair inquiry; and "Wear Specials" are very little changed at 13s. per ton f.o.b. There are no contracts of note in the market just now. Buyers are hoping for lower freights soon; but there are not yet many indications of this. In the coke trade, exports are fairly full. Gas coke is plentiful, and stocks are heavy at some inland works. Good gas coke may be quoted at 11s. to 12s. per ton f.o.b. in the Tyne; but the export trade is made irregular by high freights also.

Gas and Electricity Extensions at Nottingham.

Much having been accomplished during the last eighteen months at Nottingham in increasing the efficiency of the arrangements for gas production, attention is now being directed by the Committee having charge of the Electricity Department to the necessity for extensions. The whole of the capital sum of £44,500 sanctioned by the Council in the latter part of 1903 having been expended, it is proposed to raise £20,000 for the provision of new mains in different parts of the city; it being computed that, if the term for repayment is fixed by the Local Government Board at 24 years, the approximate annual charge for sinking fund and interest will be £1330. The project which was mooted some time ago for "harnessing" such power as could be derived from the River Trent for the production of electrical energy, has now been effectively shelved, upon the score of its impracticability. The determination of the Gas Committee, however, to further develop the Radford works, where a first instalment of vertical retorts was some months since put into operation, remains part of a settled policy.

Lincoln Gas Supply.—Opposition is foreshadowed by one of the district authorities to the Omnibus Bill of the Lincoln Corporation, under which powers are being sought, *inter alia*, for the extension of the gas supply. The Branston District Council are seeking an undertaking that more shall not be charged to outside consumers than to those resident within the city.

Heavy Gas Consumption in Manchester and Salford.—The gloomy weather in Manchester and Salford during Christmas Day, Boxing Day, and the following Sunday was responsible for a substantial increase in the consumption of gas. According to the official returns, Manchester claimed no less a consumption than 55,566,000 cubic feet in the three days, which is about 1,000,000 feet more than the Christmas week-end of 1913. At Salford, the highest pressure was maintained, especially on Christmas Eve, when the demand, owing to the fog, was exceptionally heavy. The increase in consumption as compared with the previous year was well over 500,000 cubic feet.

Gas-Mantle Question at Belfast.—A deputation from the Master Plumbers' Association waited on the Belfast Corporation last Friday, urging that the Council should rescind a resolution deciding to deal in gas-mantles, and afterwards, on the Gas Committee's report, it was agreed that the question should be reconsidered. Mr. Alexander and Mr. Finnigan declared the action of the Committee to be an encroachment on the trade of shopkeepers. Mr. Squire, on behalf of the Committee, said they stocked the mantles, and would give the shopkeepers 45 per cent. profit. The Committee, he added, did not really want to make a profit on the mantles, which were recommended as the most suitable for Belfast gas.

Lurgan Gas Bill.—A meeting of ratepayers in Lurgan, presided over by Mr. John Mehaffy, J.P. (the Chairman of the Urban Council), passed a resolution approving of the Council's Bill for the transfer of the undertaking of the Lurgan Gas Light and Chemical Company, Limited, to the Council, and to make further provision for the supply of water and electricity. Mr. Mehaffy explained that the prevailing opinion for a long time past had been that the Council should own the gas-works; but it was known that the present holders could not be induced to part with the undertaking except at what most people thought a prohibitive price. The promotion by the Council of a Bill to introduce electric lighting had, however, altered the Company's views; and they had been induced to sell for £40,000, instead of the £58,000 originally asked. Many believed the gas scheme should not be embarked upon unless the Council could supply gas at 2s. 6d. per 1000 cubic feet; but to do this, having regard to the amount of the purchase money, would be foolish in the extreme. They hoped to be in a position to reduce the present price of gas, to improve the quality, and to contribute to the rates from profits.

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(BRANCH OF METERS LIMITED),

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Testing High-Pressure Gas-Meters in Manchester.

In the annual report of the Manchester City Justices Committee, who have control of the Gas-Testing Department, reference is made to the want of suitable apparatus for testing high-pressure gas-meters. In the early part of the year an application was made to the Inspector for a number of these meters to be tested. The Committtee explained that they had neither power to provide apparatus for the purpose nor authority to apply suitable tests; and they decided that, in the present circumstances, it was undesirable that this class of meter should be stamped in the absence of statutory powers, as the tests prescribed by the Sale of Gas Act, 1859, are quite inadequate and misleading. The applicant was therefore informed that these meters could not be tested in the Manchester office until suitable apparatus was authorized and provided for the purpose. From time to time the Committee have drawn the attention of the Board of Trade to the matter, and for more than two years correspondence has passed on the subject without any definite result being arrived at. The London County Council and the Corporation of London have obtained parliamentary powers to enable them to provide apparatus for testing high-pressure gas-meters; and should these prove satisfactory, it is thought the Board of Trade would take steps to extend them to authorities generally.

German Coal for London Gas-Works.—Under the heading of "The Coal Industry in 1914," the "Iron and Coal Trades Review" last Friday said: "In the foreign trade, German competition was keen, and it was not long before attention was widely drawn to the fact by the diversion to Westphalia of part of an important Swedish contract, and of other orders usually secured by this country; while quite a small sensation was caused in February by the news that the Westphalian Syndicate had sold coal to the London Gas Companies. A great deal of nonsense was at once printed on the subject, and we were told that henceforth we were to become a coal-importing instead of a coal-exporting country; but the truth seems to be that a German firm connected with the Syndicate had sold a large tonnage of Durham gas coal for delivery over 1914 at a very low price, and that the scheme was to shake the Durham market so that the contract might be covered on profitable terms. With this end in view the London Gas Companies were tempted by special quotations; and no doubt they themselves were also anxious to see Durham prices lower. At any rate, no more buying of German coal for the British market was heard of subsequently; and according to the Board of Trade returns our total imports of coal, coke, and manufactured fuel in the eleven months ended with November were only 43,500 tons."

Nitrogen Products and Carbide Company.

Reference was made in the "JOURNAL" some eighteen months ago to the newly-issued prospectus of the Nitrogen Products and Carbide Company, Limited; and the work done by Mr. Frederick D. Marshall in connection with the erection of a plant at Vilvorde (Belgium), to convert ammonia from cyanamide into nitric acid, was explained. The first annual general meeting of the Company was held last Tuesday, and in the course of his remarks on the position of affairs the Chairman (Mr. A. E. Barton) said: "The method of the distillation of ammonia from cyanamide has recently been very much improved, and is now looked upon as a perfect process. In this connection, I might state that, after thorough investigation and practical tests, extending over a period of several months, a large industrial company, in which important French banks are interested, were so satisfied with the results attained that they have erected special plant at their works, and entered into a contract to take from us from 15,000 to 25,000 tons of cyanamide per annum, commencing next month. The cyanamide will be converted by them into ammonia for use in their compounds, instead of using ammonia from gas liquor as hitherto. This, we believe, to be only the commencement of a much larger business in this direction, as the consumption of ammonia for many and varied purposes, in all parts of the world, is a large and growing one. As the owners of such vast water powers, and with a unique chemical process such as ours, and the control of a large supply of cyanamide, there is little doubt that this Company must eventually become a most important factor in the nitric acid, ammonia, and fertilizer markets of the world."

Bradford Gas Output.—At a meeting of the Bradford Gas Committee on Friday, the Gas Engineer and Manager (Mr. Charles Wood) reported that the Christmas holidays had passed off smoothly at the gas-works. During the previous week, the output of gas had increased by about 5 per cent. compared with the corresponding week of 1913; supplies of coal had been plentiful and there was no necessity for depleting stocks; and the demand for coke continued good.

Gas Supply of Shirley (Solihull).—The Birmingham Corporation Gas Committee have, owing to the rapid development of the district, received an application from the Solihull Gas Company for a supply of gas in bulk at Shirley, which is in the Company's area of supply. Under the provisions of the Solihull Gas Act, 1886, the Committee have agreed to supply the Company with gas in bulk as requested for a period of seven years from the 1st inst., upon terms which include a guarantee as to minimum consumption.

GAS COMPANIES IN THE STOCK EXCHANGE.

During the past week little of noteworthy interest has occurred in the Stock and Share Market. This was only to be expected, seeing that this period, following on Christmas holiday inaction, was itself interrupted by the New Year holiday, and, moreover, marked the termination of that most uncomfortable interregnum which has governed dealings between the closing of the Exchange on the 30th of July and its reopening (under limitations) yesterday. Gratifying as it may be to be relieved from the "trench," members did not seem to be looking forward with intense enthusiasm to the new state of things. Though it is pretty generally recognized that the conditions imposed for the regulation of business were practically a necessity, yet doubts and misgivings are entertained that, in the result, inside business may be a sufferer from the competition of outside business, and it is not quite clear how far control of this can be enforced by authority. The situation is a difficult one and awaits development. Last week the market tendencies presented no very salient features—movements being for the most part irregular. Owing to the closing of the Stock Exchange, and the consequent absence of an Official List of prices on the 31st of December, it is not possible to present the usual comparative table showing the changes in quotation of gas securities as compared with the corresponding day of the preceding year, and their rises or falls in value.

Bank rate (fixed Aug. 8) 5 per cent.; last year, 5 per cent.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE STOCK EXCHANGE ON JULY 30.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59–64	..	3 18 2
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76–79	..	5 1 3
280,000	5	April 29	7½	Bombay, Ltd.	5⅞–6⅜	..	5 17 8
50,0.0	10	Feb. 26	16	Bourne-mouth Gas & Water Pref. 6 p.c.	29–30	..	5 6 8
378,480	10	,,	7	Do. B 7 p.c.	15–15½	..	4 10 4
95,000	10	,,	6		13½–14	..	4 5 9
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261–266	..	5 5 3
330,000	,,	,,	11	Do. New	204–209	..	5 5 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	109–111	..	4 10 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91–93	..	4 6 0
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208–213	..	5 3 4
244,200	,,	,,	8	Do. A Ord. Stk.	154–159	..	5 0 8
530,000	20	Mar. 26	12½	British	44–45	..	5 11 1
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88–90	..	4 8 11
245,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85–87	..	4 12 0
100,000	10	—	—	Cape Town & Dis., Ltd.	1½–2½	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	¼–6	..	—
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70–75	..	6 0 0
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	108–110	..	4 10 11
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2
560,000	,,	,,	5½	Do. 3½ p.c. do.	103–105	..	5 1 6
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½–71½	..	4 3 11
800 000	Stk.		4	Continental Union, Ltd.	76–79	..	5 1 3
200 000	,,	,,	7	Do. 7 p.c. Pref.	115–118	..	5 18 8
492,270	Stk.	—	6	Derby Con. Stk.	123–125	..	4 16 0
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11
1,002,180	10	July 29	10	European, Ltd.	17½–18*	..	5 11 1
16,362,910	Stk.	Feb. 12	4/17/4	Gas Light and Coke	4 p.c. Ord.	..	4 15 6
2,600,000	,,	,,	3½		3½ p.c. max.	..	4 8 7
4,062,235	,,	,,	4		4 p.c. Con. Pref.	..	4 0 10
4,674,850	,,	June 11	3		3 p.c. Con. Deb.	..	4 0 6
258,740	Stk.	Mar. 12	5	Hastings & St. L. 5½ p.c.	87–89	..	5 12 4
70,000	10	April 29	11	Hongkong & China, Ltd.	16½–16⅝	..	6 11 4
131,000	Stk.	Mar. 12	7⅞†	Ilford A and C	151–154	..	5 2 4
65,780	,,	,,	6¾†	Do. B	115–118	..	5 8 0
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92–94	..	4 5 1
4,940,000	Stk.	May 14	9	Imperial Continental	150–160	..	5 12 6
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84–86	..	4 1 5
200,342	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119–121	..	5 7 5
561,000	Stk.	Feb. 26	10	Liverpool United A	211–213	..	4 13 11
718,100	,,	,,	7	Do. B	146–148	..	4 14 7
306,083	,,	June 26	4	Do. Deb. Stk.	97–99	..	4 0 10

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	June 11	6	Malta & Mediterranean	4½–4⅝	..	6 9 9
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99–101	..	4 9 1
541,920	20	May 28	4	Monte Video, Ltd.	11½–12	..	6 13 4
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	9c½–99½	..	4 10 6
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82–83	..	4 4 10
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14–15	..	5 2 8
300,000	Stk.	May 14	8	Oriental, Ltd.	117–122	..	6 11 2
60,000	5	Mar. 26	10	Ottoman, Ltd.	7½–7⅝	..	6 9 0
60,000	50	Feb. 26	13	Portsea, Island B	128–131	..	4 19 3
100,000	50	,,	12	Do. C	118–121	..	4 19 2
249,980	5	April 29	8	Primitiva Ord.	5½–6	..	6 13 4
499,960	5	June 26	5	,, 5 p.c. Pref.	4½–5	..	5 0 0
521,600	100	June 2	4	,, 4 p.c. Deb.	91–93	..	4 6 0
346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85–87	..	4 12 0
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½–11	..	5 9 1
125,000	50	July 1	5	5 p.c. Deb.	47–49	..	5 2 0
135,000	Stk.	Mar. 12	10	Sheffield A	233–234	..	4 9 3
209,984	,,	,,	10	Do. B	232–234	..	4 9 3
523,500	,,	,,	10	Do. C	220–222	..	4 10 1
90,000	10	May 28	9	South African	10½–11½	..	7 16 6
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	111–113	..	4 16 8
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½–74½	..	4 0 6
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157–159	..	5 6 11
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	..	5 3 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	110–112	..	4 9 3
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116–118	..	4 4 9
629,740	Stk.	May 14	5	Southampton Ord.	99–102	..	4 18 0
120,000	Stk.	Feb. 12	7½†	Tottenham District A 5 p.c.	135–138	..	5 8 8
742,275	,,	,,	6†	B 3½ p.c.	115–117	..	5 2 7
181,255	,,	June 26	4	4 p.c. Deb.	87–89	..	4 9 11
182,380	10	Dec. 30	5	Tuscan, Ltd.	5–6	..	8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93–95	..	5 5 3
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	103½–109½	..	4 11 4
				Wandsworth, Wimbledon, and Epsom—			
90,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151–156	..	5 7 4
255,686	,,	,,	6⅞	,, B 3½ p.c.	129–134	..	5 2 7
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110–115	..	5 2 0
352,000	,,	,,	6⅜	Wimbledon 5 p.c.	117–122	..	5 0 5
98,000	,,	,,	6⅜	Epsom 5 p.c.	121–126	..	5 5 2
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66–69	..	4 6 11

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

Goodall, Clayton, and Co., Limited.—Messrs. Leech, Goodall, and Co., Engineers and Contractors, of Leeds, announce that, with a view to the extension of their business, it has been thought desirable to form it into a limited company. This has now been done; and in future the concern will be carried on under the style of Goodall, Clayton, and Co., Limited, at Pepper Road, Hunslet, Leeds. Mr. W. B. Leech, of course, retired as a partner in the firm on his taking up the position of Engineer of the Leeds Corporation Gas-Works; but with this exception the management of the business will be as heretofore, with Mr. C. A. Goodall as Managing-Director. The capital of the Company is £40,000, in £1 shares. The first Directors of the new concern are: L. Clayton and J. Clayton (life Directors), J. J. Baines, R. G. Thomson, and C. A. Goodall.

An Increase in Price at Exeter.—The Directors of the Exeter Gas Company give notice that, owing to the heavy extra cost of manufacture, due to increases in prices and general expenses, they are reluctantly compelled to advance the price of gas 2d. per 1000 cubic feet, from 2s. 4d. to 2s. 6d., as from the taking of the indexes of the meters at Christmas, 1914. In view of the Company's good record in the matter of reductions of price, consumers will rest satisfied that the present increase is a mere temporary necessity in Exeter, as in various other places. As recently as 1909 the price charged by the Company was 2s. 9d. per 1000 cubic feet. In 1910 it was reduced to 2s. 7d., and in 1911 to 2s. 6d.; while last January it was further lowered to 2s. 4d.—a very moderate figure, particularly when account is taken of Exeter's geographical position with regard to coal supplies, &c.

Brighouse and the Sulphate of Ammonia Committee.—When there came before the Brighouse Town Council a recommendation by the Gas Committee that the Corporation should subscribe for twelve months to the Sulphate of Ammonia Committee, Mr. Naylor raised an objection to the proposal, on the ground that the Sulphate Committee was a "ring," which had been formed to force-up the price of the commodity artificially. Mr. J. F. Bottomley (the Chairman of the Gas Committee) said they were merely being asked to give their support to a legitimate business organization for their own benefit. The price of sulphate of ammonia was much too low; and this was an effort to obtain a price commensurate with the cost of production. The resolution was carried by a large majority.

Making Records at Birmingham.—Things have been "humming" at the gas-works of the Birmingham Corporation—owing largely, of course, to the special nature of many industries carried on in the district. During the week ending Dec. 23 the output of gas reached 281½ million cubic feet, an increase of 32 millions over the corresponding week of 1913, and of 14 millions on the previously recorded maximum weekly consumption—in January last, when in one week the output was 267½ millions. The maximum daily output prior to last December was reached on Dec. 23, 1913, when the consumption was 43 million cubic feet; but on Dec. 11, 1914, the output was 43⅜ millions. On Dec. 21 it was 44¾ millions, on Dec. 22 44½ millions, and on Dec. 23 46¼ millions—the last total being a record day's consumption. On Christmas Eve and Christmas Day the consumption was much higher than on the same days of the preceding year. The sales of gas for the quarter ended Sept. 30 last showed an increase of 107,414,500 cubic feet, or 5·7 per cent., as compared with the corresponding period of the previous year.

The Cannon Iron Foundries, Limited, have transferred their London offices and show-rooms to Bath House, Nos. 57 to 60, Holborn Viaduct, E.C.

The statement is made that Messrs. Myers and Co., of Hackney Road, E., have, in order to cope with War Office demands for 4500 peak caps per day for the soldiers, been able, at very short notice, to extend their accommodation by equipping new premises with gas irons, gas lighting, and gas heating.

"How to Solve the Domestic Trouble of the Day" is the title of a booklet sent out, with seasonable greetings, by the South Brisbane Gas and Light Company, Limited. Information is contained in it on a variety of subjects—including the use of gas for light, heat, and power, and the preparation of tempting dishes.

The Brighouse Master Plumbers' Association have entered a protest against the continuance of the municipal gas show-room. The Gas Committee of the Corporation have appointed a Sub-Committee to consider the matter. The show-room, it may be mentioned, has been in existence (and, from the point of view of the gas authority, successfully) for some time past.

At Wath-on-Dearne, last Friday, the opening ceremony took place in connection with water-works extensions which have cost £12,000. The ceremony was performed by Mr. Godber (the Chairman of the Water Committee). The pumping plant will force water to the reservoirs at the rate of 25,000 gallons an hour. The holding capacity of the new and old reservoirs is 900,000 gallons. About three miles of new mains have been laid.

The "Petrojector" Gas Company, Limited, has been formed with a capital of £1000, in £1 shares, to carry on business as manufacturers of gas-generating plant and equipment and engineers. Under the title of J. Barwell and Co. (Lighting), Limited, a company has been formed with a capital of £5000, in £1 shares, to carry on business as manufacturers of lamps, brackets, meters, stoves, pipes, wires, and electric light and gas fittings.

An inquest was held in the Battersea Coroner's Court last Friday on the body of a solicitor named Truefit, who was found dead in an armchair. All the windows were closed, a rug was placed against the door, and two taps of the stoves were turned full on, with the gas unlighted. Papers found on the premises proved that deceased was much troubled financially; and the Jury came to the conclusion that he had committed suicide while temporarily insane.

At to-morrow's meeting of the Leeds City Council, Mr. Masser will propose—"That the Gas and Tramways and Electricity Committees be directed to each appoint three members to form a Joint Sub-Committee, whose duties shall be to consider and report to the full Committees from time to time on all questions relative to the sale of gas and electricity to consumers, with a view of preventing overlapping and competition in the sale of these commodities."

Various welcome reminders of the dawn of a new year have reached us. Diaries and pocket books have been received from the Gas-Meter Company, the Torbay Paint Company, and Messrs. Willey and Co.; a calendar desk pad from Messrs. Parkinson and W. & B. Cowan; and desk calendars and date blocks from Messrs. Simon-Carvès, Limited, Stewarts and Lloyds, and the Wigan Coal and Iron Company. We have also received a number of wall calendars.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

DRAUGHTSMAN. W. J. Jenkins and Co., Retford.
DRAUGHTSMEN. Robert Dempster and Sons, Limited, Elland.
CHEMICAL PLUMBER. Staveley Coal and Iron Company, Chesterfield.
GAS-WORKS FOREMAN. No. 5971.

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Sales of Stocks and Shares.

ASCOT DISTRICT GAS AND ELECTRICITY COMPANY. London Mart. Jan. 19.
BOURNEMOUTH GAS AND WATER COMPANY. London Mart. Jan. 19.
BROADSTAIRS GAS COMPANY. London Mart. Jan. 19.
COLOMBO GAS AND WATER COMPANY. London Mart. Jan. 19.

Sales of Stocks and Shares (*continued*).

REDDITCH GAS COMPANY. Grand Hotel, Birmingham. Jan. 28.
TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY. By Tender. Jan. 19.
WORTHING GASLIGHT COMPANY. London Mart. Jan. 19.

TENDERS FOR

Fire Clay Goods.

MANCHESTER GAS DEPARTMENT. Tenders by Jan. 14.
ROTHERHAM GAS DEPARTMENT. Tenders by Jan. 18.

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